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CALCUTTA  
1938



PART I. JOURNAL, LETTERS.

PART II. JOURNAL, SCIENCE.

PART III. YEAR-BOOK.



**JOURNAL**  
**OF THE**  
**ROYAL ASIATIC SOCIETY**  
**OF BENGAL**

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**LETTERS**

**VOLUME II**

**1936**



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## NOTICE

His Majesty, the King Emperor, has been graciously pleased to grant permission to the Asiatic Society of Bengal to use the title 'Royal' before its name.

The Society, therefore, will henceforth be known as the 'Royal Asiatic Society of Bengal', and the *Journal* and *Year-Book* will be called *Journal of the Royal Asiatic Society of Bengal* and *Year-Book of the Royal Asiatic Society of Bengal*, and the abbreviations for references will be: JRASBL; JRASBSc; and YBRASB.

UPENDRANATH BRAHMACHARI, Kt.,

*Actg. General Secretary,*

*Royal Asiatic Society of Bengal.*

CALCUTTA,

1 PARK STREET,

*August, 1936.*



· Islāmic Apocrypha (Tadlīs).

By M. Hidayat Hosain.

The literary activities of the whole Islāmic world are rooted in the Qur'ān and the Hadīth. The Qur'ān is being preserved by innumerable adherents of Islām by committing it to memory and as such there is no possibility of any addition to, omission from, or alteration of a single word, in the text of the Qur'ān ; but the Hadīth covers a vast literature and the early Islāmic scholars devised means and rules to establish its authenticity. *Tadlīs* removes the Hadīth from the category of Hadīth Ṣaḥīḥ (sound Hadīth) to that of unauthentic ones.

According to the Arabic lexicon<sup>1</sup> *Tadlīs* means 'to conceal a fault or defect in an article of merchandise, from the purchaser', and according to the traditionists, 'to conceal the defects of the Hadīth, either in the text, in the chain of narrators or in the source', i.e. the teacher from whom it is learnt.<sup>2</sup>

*Tadlīs* is of three kinds. They are, (1) *Tadlīs fi'l Isnād* (تدليس فى الاسناد) *Tadlīs in the chain of narrators* ; (2) *Tadlīs fi'l Matn* (تدليس فى المتن) *Tadlīs in the text* ; and (3) *Tadlīs fi'sh Shuyūkh* (تدليس فى الشيوخ) *Tadlīs in the teacher from whom the tradition is learnt*.

I. *Tadlīs in the chain of narrators.*

It is classified under seven heads, viz. :—

(1) The narrator narrates a Hadīth from a teacher from whom he has learnt other Hadīths, but the particular Hadīth is not directly learnt from the teacher but through a person who had learnt from the teacher. At the time of narration, the narrator narrates in a language which goes to show that he has learnt it direct from the teacher, e.g. instead of '*ḥadda-  
thanā*' (حدثنا)—narrated to us—or similar words, the narrator uses the expression *Qāla fulān* (قال فلان)—such and such a person said.

(2) The narrator mentions the chain of narrators from whom the Hadīth is learnt, but omits the names of those who

<sup>1</sup> Lane's *Arabic English Lexicon*, Book I, Part III (1867), p. 903.

<sup>2</sup> *Zafr al-Amānī fi Mukhtaṣar al-Jurjānī*, p. 213 ; see also *Journ. Asiat. Soc. Bengal*, 1856, p. 218 ; Salisbury, p. 92, I ; Risch, p. 20 ; Sprenger, *Mohammad III*, p. xcix, *übersetzt es : unredlichkeit*, and Goldziher, *Muhammedanische Studien*, vol. II, p. 48.



are considered weak traditionists, or are of minor age, or are untrustworthy. This kind of *tadlis* is called *Tadlis tajwīd* or *tasviya* (تدليس تجويد با تدليس تسوية). *Tasviya* (تسوية) means 'to make equal', i.e. to establish on an equal footing with other *Hadiths*. *Tajwīd* (تجويد) means 'to show a thing as perfect'. This is the worst kind of *Tadlis*. Baqīya<sup>1</sup> bin al-Walid,<sup>2</sup> Walid bin Muslim<sup>3</sup> and Hasan bin Dhakwān<sup>4</sup> were in the habit of practising this kind of *Tadlis*.

(3) The narrator mentions also another name, or names, along with the source from which he has heard the tradition, but he has actually never heard it from such a person or persons. This is called *Tadlis al-‘Atf* (تدليس العطف) on account of the *‘Atf* (conjunction); *wāw*, e.g. *Haddathanā fulān wa fulān* (حدثنا فلان و فلان) so and so, and so and so have narrated. The narrator had never learnt from the second 'so and so'.

(4) The narrator pauses for a moment after saying (حدثنا) *haddathanā* and after a while mentions the name of the person from whom he has not learnt the tradition: as for instance Ibn ‘Adī<sup>5</sup> in *al-Kāmil* says that ‘Umar bin ‘Ubaid<sup>6</sup> at-Ṭanāfīsī used to say *haddathanā*, then remained silent, and after a while said that Hishām bin ‘Urwa<sup>7</sup> narrated from his father, who

<sup>1</sup> This is the expression which is used by the traditionists:—

احديث بقية ليست بنقية كن معنا على تقية

The traditions narrated by Baqīya are not genuine, so be on guard against it.

<sup>2</sup> Abū Muḥammad Baqīya bin al-Walid al-Kalā‘ī was born A.H. 115, A.D. 733 and died A.H. 197, A.D. 812 or A.H. 198, A.D. 813. See adh-Dhahabī, *Mizān al-I‘tidāl*, vol. I, pp. 154–158, and Ibn Hajar al-‘Asqalānī, *Tahdhīb at-Tahdhīb*, vol. I, pp. 473–478.

<sup>3</sup> Abū ‘l ‘Abbās Walid bin Muslim ad-Dimashqī was born A.H. 119, A.D. 737 and died A.H. 195, A.D. 810. *Mizān al-I‘tidāl*, vol. III, p. 275, *Tahdhīb at-Tahdhīb*, vol. XI, pp. 151–155 and adh-Dhahabī, *Tahdkirat al-Huffaz*, vol. I, p. 278.

<sup>4</sup> Abū Salama al-Ḥasan bin Dhakwān narrates *Aḥādith* from Ibn Sirīn (d. A.H. 110, A.D. 728), Ṭā‘ūs, and Abū Rijā al-‘Utārādī. For further particulars of his life see *Mizān*, vol. I, p. 227 and *Tahdhīb*, vol. II, p. 276.

<sup>5</sup> The full name of Ibn ‘Adī is Abū Aḥmad ‘Abdallāh bin Muḥammad al-Jurjānī. He twice visited Syria and Egypt for the sake of study. His first journey was in A.H. 297, A.D. 909. The full name of his work *al-Kāmil* is *al-Kāmil fī ma‘rifat ad-Du‘afā’ wa’l Matrūkīn* and it is a masterpiece on the subject of determining the weak and rejected traditionists. He died A.H. 365, A.D. 975. *Ṭabaqāt al-Kubrā*, vol. II, p. 233, and H. Khalifa, vol. V, p. 28.

<sup>6</sup> ‘Umar bin ‘Ubaid at-Ṭanāfīsī was born A.H. 104, A.D. 722 and died A.H. 185, A.D. 801 or 187 (802) or 188 (803). *Mizān al-I‘tidāl*, II, p. 265, and *Tahdhīb*, VII, p. 480.

<sup>7</sup> Hishām bin ‘Urwa died A.H. 146, A.D. 763. *Shadharāt adh-Dhahab*, vol. I, p. 218, and *Mizān al-I‘tidāl*, vol. III, p. 255.

narrates from 'Ā'isha,<sup>1</sup> but he had never heard the Hadīth from Hishām. This kind of *Tadlīs* is called *Tadlīs al-Qaṭa'* (تدليس القطع). *Qaṭa'* (قطع) means to cut, on account of the interruption caused by his silence.

(5) A teacher gives permission to a student to narrate Hadīth though the latter had not actually studied under him. The student says at the time of narration *ḥaddathānā* or *akhbaranā*, which implies that he heard it direct from the teacher, whereas he should have said *Ajāzanā* (أجازنا), i.e. 'I was permitted to say'.

The other aspect of this kind of *Tadlīs* is that a student obtains a book from his teacher<sup>2</sup> in which Hadīths are recorded and the student has neither read with nor heard from the teacher. At the time of narration, the student says *Ḥaddathānā* or *Akhbaranā* (حدثنا أو أخبرنا) which shows that he had learnt from the teacher. Ishāq bin<sup>3</sup> Rāshid al-Jazarī and Faṭr bin<sup>4</sup> Khalifa were in the habit of saying *ḥaddathānā* or *akhbaranā* though they had never heard the Hadīth from their teachers.

(6) The narrator does not say *ḥaddathānā* or *akhbaranā*, and ascribes the Hadīth to his *Shaikh* (teacher) along with the chain of narrators though he had not heard it from his *Shaikh*. Al-Hākim has written about Sufyān bin 'Uayayna<sup>5</sup> (سفيان بن عيينة) that Sufyān once said az-Zuhri<sup>6</sup> and then mentioned the whole chain of narrators. When the students enquired whether he had heard it from az-Zuhri, he replied that he had neither heard it from az-Zuhri nor from anybody who had heard from az-Zuhri, but he learnt it from 'Abd ar-Razzāq<sup>7</sup> who heard

<sup>1</sup> 'Ā'isha was the wife of the Prophet and the daughter of Abū Bakr aṣ-Ṣiddīq. She died A.H. 58, A.D. 677. Ibn Qutaiba, *Kitāb al-Ma'ārif*, p. 65.

<sup>2</sup> The technical name of such a kind of book amongst the traditionists is '*Wajāda*'.

<sup>3</sup> Ishāq bin Rāshid al-Jazarī was a pupil of az-Zuhri (died A.H. 125, A.D. 742). He died at Sijistān in the reign of Abū Ja'far (Manṣūr the 'Abbaside Caliph A.H. 136-158, A.D. 754-775). *Tahdhīb at-Tahdhīb*, vol. I, p. 230.

<sup>4</sup> Faṭr bin Khalifa al-Qurashī al-Makhzūmī died A.H. 155, A.D. 771 or as some say A.H. 153, A.D. 769. *Tahdhīb at-Tahdhīb*, vol. VIII, p. 300 and *Mizān al-I'tidāl*, vol. II, p. 335.

<sup>5</sup> Sufyān bin 'Uayayna al-Hilālī died A.H. 198, A.D. 813. *Mizān al-I'tidāl*, vol. I, p. 397.

<sup>6</sup> Az-Zuhri's full name is Abū Bakr Muḥammad bin Muslim bin 'Ubaidallāh bin 'Abdallāh bin Shihāb al-Qurashī az-Zuhri al-Madanī. He was a very reliable traditionist. Different dates are given about his birth and death. He was born A.H. 50 or 51 or 56 or 58 and died A.H. 123 or 124 or 125. *Tahdhīb at-Tahdhīb*, vol. IX, p. 450. *Adh-Dhahabī* in *Mizān al-I'tidāl*, vol. III, p. 126 says that he died A.H. 128, A.D. 745.

<sup>7</sup> The full name of 'Abd ar-Razzāq is 'Abd ar-Razzāq bin Humām bin Nāfi' al-Ḥamyari. He narrated Hadīth from Ma'mar and others.

it from Ma'mar<sup>1</sup> who learnt it from az-Zuhri. This kind of *Tadlis* is called *Tadlis Isqāt Adāt ar-Riwāya* (تدليس اسقاط اداة الرواية) or terms *akhbaranā* or *ḥaddathanā* are dropped.

(7) The narrator mentions the name of a famous place, but he does not mean that place, but another place of the same name. This the narrator does in order that people might know that he has wandered through distant places in search of *Hadīths*. This kind of *Tadlis* is called *Tadlis al-Bilād* (تدليس البلاد), e.g. an Egyptian traditionist said 'so and so narrated to him in 'Irāq' (حدثنا فلان بالعراق). By 'Irāq' he meant a place near Egypt known as *bākhmīm* and not the Persian 'Irāq.

## II. *Tadlis in the Text.*

*Tadlis* in the text (تدليس في المتن) is also called *Mudraj fī'l Matn* (مدرج في المتن), i.e. inserted into the text (interpolation).

The narrator includes in the narration his own statement, or of some other persons, thereby making people to believe that it is also a part of the *Hadīth*. Such a kind of *Tadlis* might occur in :

- (1) the beginning of the text of *Hadīth* and is termed *Mudraj fī Awwal al-Matn* (مدرج في اول المتن).
- (2) the middle of the narration and termed *Mudraj fī Wasṭ al-Matn* (مدرج في وسط المتن).
- (3) the end of the narration and called *Mudraj fī Ākhir al-Matn* (مدرج في آخر المتن).

## III. *Tadlis in the teacher from whom the tradition is learnt.*

The narrator narrates that he learnt the tradition from his teacher and instead of giving the familiar name of the teacher, he mentions his nick-name, or some other appellation, or some of his unfamiliar names. The narrator does this because the teacher might be a weak traditionist, and in this manner his weak points might escape attention, and the hearers might be led to think the *Hadīth* to be true. For example, a narrator might say that he heard the tradition from Hammād whose

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He was born A.H. 126, A.D. 743 and died A.H. 211, A.D. 826. *Tahdhīb at-Tahdhīb*, vol. VI, p. 310.

<sup>1</sup> The full name of Ma'mar is Ma'mar bin Rāshid al-Azadi. He narrated *Hadīths* from az-Zuhri and others. He died A.H. 152 or A.H. 153 or A.H. 154 (A.D. 770). *Tahdhīb at-Tahdhīb*, vol. X, p. 243 and *adh-Dhahabī, Tadḥkirat al-Ḥuffāz*, vol. I, p. 178.

familiar name was Muḥammad bin Sā'ib al-Kalabī<sup>1</sup> and who was accused of citing unreliable Hadīths.

These are the eleven kinds of *Tadlis*.

Burhān ad-Dīn Al-Ḥalabī<sup>2</sup> in his work *at-Tab'īn li Asmā' al-Mudallisīn* has said that<sup>3</sup> *Tadlis* had hardly occurred after 300 A.H. (A.D. 912). Al-Ḥākim<sup>4</sup> has stated that he did not know in later traditionists anyone who had practised *Tadlis* except Abū Bakr Muḥammad bin Muḥammad bin Sulaimān al-Bāghdādī.<sup>5</sup>

The first author<sup>6</sup> who wrote a book on *Tadlis* is al-Karābīsī<sup>7</sup>; he was followed by an-Nasā'ī,<sup>8</sup> ad-Dāraqutnī,<sup>9</sup> al-Khaṭīb,<sup>10</sup> al-Baḡhdādī<sup>11</sup> and Ibn 'Asākir.<sup>12</sup> Later authors who have

<sup>1</sup> Muḥammad bin Sā'ib al-Kalabī died A.H. 146, A.D. 763. *Shadharāt*, vol. I, p. 217 and *Mizān al-Itidāl*, vol. III, p. 61.

<sup>2</sup> See, for his life, p. 6, footnote 7.

<sup>3</sup> See *Zaḡr al-Amānī fī Mukhtasar al-Jurjānī*, p. 213.

<sup>4</sup> Abū 'Abdallāh Muḥammad bin 'Abdallāh al-Ḥākim an-Naisābūrī was born A.H. 321, A.D. 933. As a traditionist he gained a wide reputation in the Islāmic world. He died A.H. 405, A.D. 1014. *Tadhkirat al-Huffāz*, vol. III, p. 227.

<sup>5</sup> Al-Bāghdādī died A.H. 312, A.D. 924. *Lisān al-Mizān*, vol. V, p. 360.

<sup>6</sup> See Ibn Hajar, *Tabaqāt al-Mudallisīn*, p. 2.

<sup>7</sup> His full name is Abū 'Alī al-Ḥusam bin 'Alī al-Karābīsī. He was a native of Baḡhdād and one of the Imām ash-Shāfi'ī's most distinguished disciples. He wrote works on that branch of science which is called *al-Jarḥ wa't Ta'dīl* (impeachment and justification) and on other subjects also. He died A.H. 245 (A.D. 859) or, according to a statement which appears more correct, A.H. 248 (A.D. 862). *Karābīsī* is formed from *Karābīs* which word designates clothes made of a sort of coarse cloth; the singular is *Kirbās* (the original Persian word is *Kirpās*). This doctor sold cloth of that sort and was therefore called al-Karābīsī. De Slane, Translation of Ibn Khallikān, vol. I, p. 416.

<sup>8</sup> His full name is Abū 'Abd ar-Rahmān Aḥmad bin Shu'aib an-Nasā'ī. He was born at Nasā' (a city in Khurāsān), A.H. 214 or 215 (A.D. 829 or 830) and was the chief traditionist of his age and author of a *Sunan* or collection of traditions. Ad-Dāraqutnī declares him a martyr, on account of the trials he underwent at Damascus, and says that he died A.H. 303 (A.D. 915) at Mecca; others state that he died at Ramla in Palestine. De Slane, Ibn Khallikān, vol. I, p. 58.

<sup>9</sup> The full name of ad-Dāraqutnī is Abū'l Ḥasan 'Alī bin 'Umar. He was born A.H. 306, A.D. 918 in Baḡhdād at a Maḥalla named Dār al-Qutn from which he is commonly known as ad-Dāraqutnī. He received his education in Baṣra, Kūfa, Baḡhdād and Wāsit and very soon his fame as a great scholar spread far and wide. He is the author of a large number of works and died A.H. 385, A.D. 995. S. Wajahat Husain, *Journal and Proceedings of the Asiatic Society of Bengal*; New Series, vol. XXX, 1934, p. 39.

<sup>10</sup> For the works of al-Khaṭīb al-Baḡhdādī and Ibn 'Asākir on *Tabaqāt al-Mudallisīn* see as-Süyūṭī, *Tadrīb ar-Rāwī*, p. 81.

<sup>11</sup> The full name of al-Baḡhdādī is Abū Bakr Aḥmad bin 'Alī. He was born A.H. 329, A.D. 1002. He is considered a very reliable traditionist and historian. He died A.H. 463, A.D. 1071. Yāqūt, *Irshād al-Arīb*, vol. I, p. 246.

<sup>12</sup> The full name of Ibn 'Asākir is Abū'l Qāsim 'Alī bin al-Ḥasan. He was born A.H. 499, A.D. 1105. He received his education at Baḡhdād in the famous Nizāmiya College and became the most eminent traditionist

written on the subject are adh-Dhahabī,<sup>1</sup> al-'Alā'ī<sup>2</sup> and others. The works of the early authors are now not available.

Adh-Dhahabī wrote a treatise in poetry on *Tadlīs* (a portion of it is found in as-Subkī, *Ṭabaqāt al-Kubrā*, vol. V, p. 218). Al-'Alā'ī has composed a treatise in prose under the title *Kitāb al-Mudallisin*<sup>3</sup> and has added more names to those mentioned in adh-Dhahabī's poem. Al-Hāfiẓ Abū Maḥmūd Aḥmad bin Ibrāhīm al-Maqdisī,<sup>4</sup> a pupil of adh-Dhahabī, supplemented adh-Dhahabī's poem with materials from al-'Alā'ī's work in order to make the poem complete. Zain ad-Dīn al-'Irāqī<sup>5</sup> added a few more names on the margin of al-'Alā'ī's book. A further supplement, as an independent treatise on the subject, has been attributed to Abū Zar'a.<sup>6</sup> Al-Ḥalabī<sup>7</sup> added more names to the last supplement and wrote a treatise under the

of his age. He died at Damascus A.H. 571, A.D. 1176. As-Subkī, *Ṭabaqāt al-Kubrā*, vol. IV, p. 273.

<sup>1</sup> The full name of adh-Dhahabī is Shams ad-Dīn Abū 'Abdallāh Muḥammad bin Aḥmad. He was born at Damascus A.H. 673, A.D. 1274. He studied under numerous scholars, served as a professor in several Madrasahs at Damascus and wrote many useful works. He was a well-known traditionist of his time. He died A.H. 748, A.D. 1348. As-Subkī, *Ṭabaqāt*, vol. V, p. 216.

<sup>2</sup> The full name of al-'Alā'ī is Ṣalāh ad-Dīn Abū Sa'īd Khaliḥ bin Kaikaldās al-'Alā'ī. He was born A.H. 694, A.D. 1295, and studied *Ḥadīth* under many scholars. In A.H. 718, A.D. 1318, he worked as a professor of *Ḥadīth* in the Madrasa an-Nāṣiriya at Damascus. He died in Jerusalem A.H. 761, A.D. 1359. *Ad-Durar al-Kāmina*, vol. II, p. 90.

<sup>3</sup> For the book see *Shadharāt adh-Dhahab*, vol. VI, p. 191, and as-Sakhāwī, *ad-Ḍaw' al-Lāmi'*, vol. I, fol. 42b.

<sup>4</sup> Aḥmad al-Maqdisī was born A.H. 648, A.D. 1250 and died A.H. 726, A.D. 1325. *Ad-Durar al-Kāmina*, vol. I, p. 90.

<sup>5</sup> The full name of Zain ad-Dīn al-'Irāqī is Abū'l Faḍl 'Abd ar-Raḥīm bin al-Husain al-'Irāqī. He was born in Mihrān (a place near Cairo), A.H. 725, A.D. 1325. As he was brought up in Irāq, he is known as al-'Irāqī. Ibn Ḥajar al-'Asqalānī describes him in *Irbā' al-Ḡhumar*, fol. 149, as the most eminent traditionist of his time. He died A.H. 806, A.D. 1403. *Husan al-Muhādara*, vol. I, p. 151.

<sup>6</sup> The full name of Abū Zar'a is Walī ad-Dīn Abū Zar'a Aḥmad bin Zain ad-Dīn 'Abd ar-Raḥīm al-'Irāqī. He was born A.H. 762, A.D. 1362 and studied in Egypt under his father, Zain ad-Dīn al-'Irāqī, and others. He was Chief Justice of Egypt and was reckoned the equal of his father in *Ḥadīth*. He composed a number of useful works. In A.H. 810 he renewed the system of teaching *Ḥadīth* by means of dictation, which had been discontinued from A.H. 806 after his father's death. He died A.H. 826, A.D. 1422. As-Sakhāwī, *ad-Ḍaw' al-Lāmi'*, vol. I, fol. 47a.

<sup>7</sup> The full name of al-Ḥalabī is Burhān ad-Dīn Abū'l Wafā' Ibrāhīm bin Muḥammad known as Sibṭ Ibn al-'Ajāmī, the grandson of Ibn al-'Ajāmī, as his mother belonged to al-'Ajāmī family of Ḥalab. He was born at Jullūm in Ḥalab A.H. 753, A.D. 1352. He distinguished himself in many branches of knowledge but outshone in *Ḥadīth*. He is the author of several works. He died A.H. 841, A.D. 1438. For details of his life see *Journal and Proceedings, Asiatic Society of Bengal* (New Series), vol. XXIV, (1928), p. 363.

name *at-Tab'in li Asmā' al-Mudallisīn*,<sup>1</sup> while Ibn Hajar<sup>2</sup> al-'Asqalānī completed the list with the addition of more new names and wrote a book called *Kitāb Ṭabaqāt al-Mudallisīn*, or *Ta'rif ahl at-Ṭaqdis li Marātib al-Mawṣūfīn bi't Taddīs*.<sup>3</sup>

The total number of names given in the book of al-'Alā'ī is 68. Abū Zar'a added 13 names, Halabī 32 and Ibn Hajar al-'Asqalānī 39. With all these additions the total number comes to 152. As-Suyūṭī<sup>4</sup> also wrote two treatises on the subject entitled (a) *Kashf at-Talbis 'an Qalb Ahl at-Taddīs* and (b) *Risāla fī Asmā' al-Mudallisīn*.

It is needless to enumerate the names and other particulars of the 152 traditionists who practised *Taddīs*. A detailed list of these traditionists is given in Ibn Hajar's *Kitāb Ṭabaqāt al-Mudallisīn*.

<sup>1</sup> For copies see Berlin Cat. No. 9946, Bodl., vol. II, No. 397, and Bankipore Cat., vol. XII, p. 55.

<sup>2</sup> The full name of Ibn Hajar al-'Asqalānī is Shihāb ad-Dīn Abū'l Faḍl Ahmad bin 'Alī. He was born A.H. 773, A.D. 1372 and travelled in different Islamic countries to study Hadith. He is the author of many useful works. As-Sakhāwī has written a book about his life and work which is called *al-Jawāhir wa'd Durar fī Tarjamat Shaikh al-Islām Ibn Hajar*. A copy of it exists in the *Bibliothèque Nationale*, Paris. See De Slane Cat. No. 2105. He died A.H. 852, A.D. 1449. *al-Khīṭaṭ al-Jadīda*, vol. VI, p. 37.

<sup>3</sup> It is printed in Egypt, A.H. 1322; see Sarkis, p. 80.

<sup>4</sup> The full name of as-Suyūṭī is Abū'l Faḍl Jalāl ad-Dīn 'Abd ar-Rahmān bin Abī Bakr. He belonged to a Persian family who had been residing for three hundred years at Suyūṭ in Upper Egypt; but he himself was born in Cairo A.H. 849, A.D. 1445. He studied under renowned teachers in every branch of Islāmic learning. He wrote a larger number of books than any other Islāmic writer. He died A.H. 911, A.D. 1505. *Husn al-Muḥādara*, vol. I, pp. 153, 203; vol. II, p. 65 and *Būhār Cat.* vol. II, p. 12.



## Notes on a Fourth Tour in the District of Dinajpur.

By SARASI KUMAR SARASWATI.

In March last (1935), thanks to Mr. H. E. Stapleton, late Director of Public Instruction, Bengal, I had the good fortune of undertaking another trip in the district of Dinajpur, this time by the western bank of the river Chirāmati as the third was by its eastern.<sup>1</sup> This trip also proved singularly successful, like the previous ones, in revealing several other prospective sites for antiquarian and archæological studies well worth fuller and more systematic exploration by experts. In my previous paper I have dwelt on the extreme importance of this little stream with its once flourishing settlements on its both banks. Its importance is now a thing of the past. The flourishing cities are dead and gone. Yet, to the local people, this stagnant stream still bears a high character for sanctity, almost on a par with the sacred Ganges, and a story is widely current regarding the origin of this little, but no less sanctified, stream.

In the Survey map, the river is shown to be rising suddenly out of nothing some 10 or 12 miles north of Kaliyagunj, a station on the Parvatipur-Katihar section of the Eastern Bengal Railway. Mr. Satyendra Nath Majumdar, M.A., Sub-Inspector of Schools, Raigunj Circle, Dinajpur, from whom I heard the story for the first time, informs me that the river comes out of a big north-and-south tank. The story is as follows: A Brahmin had a foster daughter named Śrīmatī, who was a widow. Once the Brahmin intended to go on a pilgrimage, and, among other places, he intended visits to the holy Benares and Prayāga and dips in the sacred Ganges and Trivenī-Saṅgama. Śrīmatī, widowed as she was, also longed for such a pilgrimage, but, being obliged to be left behind, she gave her foster father a flower to be given to Mother Ganges in her name. The Brahmin tied the flower in a corner of his scarf and set out on his holy travel. Eventually however he forgot his mission and, after a long absence from home, he came back with the flower still tied in his scarf. The widow discovered it, and her heart was almost broken to find her mission unfulfilled. But she told nothing to her foster father, took the flower from the knot, and went to the tank at the back of the house. There she prayed hard to the goddess

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<sup>1</sup> For two previous papers by the writer on the antiquities of Dinajpur *vide J.P.A.S.B.*, Vol. XXVIII, pp. 173-183 and 185-195. For a map of the district *vide* Plate 4 of Mr. Stapleton's paper in the same number of the Journal (pp. 151-171).



Gaṅgā to accept her humble offering and threw the flower into the tank, hoping and praying that it should reach the Ganges. Before the flower dropped into the waters, a pair of divine hands appeared on the surface and caught the flower. Immediately the waters of the tank swelled up and flowed down in a mighty torrent, carrying the flower, and the widow too, as if to meet the Ganges far down in the south.

### ITĀHĀR.

The Police outpost of Itāhār is some 14 miles south of Raigunj, the last station in the Dinajpur district on the Parvatipur-Katihar section. The name *Itāhār* (literally 'string of bricks') comes, so the local people say, from numerous old bricks to be found all around the village and the surrounding region, either strewn all over the surface or buried only a little below the ground level. The village contains several north-and-south tanks, of which a few are fairly big. In one or two remains of pucca *ghāṭs*, now hidden underground, may be traced. It was from here that a colossal image of Vishṇu in black basalt and of exquisite decorative workmanship was recovered in 1933 for the Indian Museum by Mr. J. C. Majumdar, the then Sub-Divisional Officer of Dinajpur. The image was lying under a peepul tree by the side of the Patirāj-Chudāman road, which crosses the north and south Rāigunj-Gājol road at Itāhār. The image was the object of veneration of the cowherd boys of the locality and was reported to have been found as a result of a chance digging in one of the two adjacent mounds. The mounds are now overgrown with jungle and are still fairly high, about 30 feet in perpendicular height from the surface level. They are full of bricks; but the unfortunate feature is that I could not get an entire brick above ground so as to have the measurement. They are however very thick, generally 3 inches. A huge, but plain, stone pillar can still be seen lying on the top of one of the mounds.

When Mr. Majumdar removed the colossal image the cowherd boys looked for another *pāshāṇa* (stone image) in a mound and were fortunate enough to find a black basalt pedestal of an image (Pl. I, Fig. 1), the main figure of which is missing from above the waist. The *saptaratha* pedestal is heavily decorated and consists of two vertical courses. The lower one consists of an elephant in full front view in the centre, flanked by two *ganas* (dwarfed demigods) resting on their staffs. The intermediate facets are occupied by two lions while the outer ones have Garuḍa to proper right and a pot-bellied figure with garland to proper left. The Garuḍa, evidently intended as the carrier, points out the deity proper, which is missing, as Vishṇu, the protector of the Universe. Above it we have the full blown lotus seat (*mahāmbujapīṭha*) supported by a *nāga* (snake) couple, flanked by two other smaller lotuses intended for the attendant figures. The deity

sits on the principal seat with crossed legs. He has four hands. The normal hands are placed on the lap in *dhyānamudrā* (pose of meditation). The additional left hand rests on the knee with palm turned outwards and bears a *chakra* (discus) with a figure in relief (*Chakrapurusha*, i.e. *Chakra* personified) within it. The attribute in the remaining hand cannot be recognized. In all probability it held a *śaṅkha* (conchshell). The attendant figures on both sides are also broken away, but that to the proper right can still be recognized as that of *Sarasvatī* from the *vīṇā* (Indian lyre) held by a hand, portions of which still remain. The main figure is heavily jewelled—*nupura* (anklet), *keyūra* (bracelet), etc. being still visible.

That the missing figure represented the great god *Vishṇu* there can be no doubt. The vehicle, *Garuḍa*, the *chakra* as one of the attributes in one of the hands and *Sarasvatī* as an attendant figure unmistakably lead us to that conclusion. But here we have a new form, quite a unique type—in striking contrast to the two or three hackneyed types that we are accustomed to in Bengal. In his *Elements of Hindu Iconography*, Vol. I, part 2, Appendix C. p. 20, Mr. T. A. Gopinath Rao quotes a *dhyāna* of *Yogāsana* *Vishṇu*, in which *Vishṇu* is to be sculptured as seated crosslegged with the front hands in *yogamudrā* (pose of meditation) pose. It is however distinctly stated there that *śaṅkha* and *chakra* ought not to be placed in the hands of this class of *Vishṇu*. Again Mr. Rao refers to another *dhyāna* in the *Siddhārtha Saṁhitā* which prescribes *śaṅkha* and *chakra* in the two additional hands. (*Ibid.*, Vol. I, part I, p. 87.) The image of *Yogāsana mūrti* from Bagali reproduced by him (Pl. XXIV) is an example of this type. The image under notice, although it differs slightly as to the position of the two additional hands, may also be assigned to the same class. It is perhaps a form of *Vishṇu* influenced by the meditative aspect of Buddhism. The execution and decoration ascribe the sculpture to the 12th century A.D.

Close to the market place at *Itāhār* a small bust of an image under a tree is the object of much awe and veneration for the local rustics, who occasionally bathe it with pigeon's blood. The miniature is of fine workmanship and may be dated in the 11th century A.D. It is remarkable for the peaceful aspect of the eyes and face, which indicates the image as that of a *Yogin*, a theory also substantiated by the *jatāmukuta* (crown of matted hair). The absence of the third eye on the forehead should preclude us from identifying it with *Śiva*. The alternative is to identify it with a Buddhist deity, either *Avalokiteśvara* or *Mañjuśrī*, and in that case, an occasional bath with blood is a most unseemly form of worship. Another Buddhist deity found at *Itāhār* is a miniature image of *Tārā* seated in *lalitāsana*, with her right hand resting on the knee in *varada* (gift-bestowing) pose and the left holding a *nīlotpala* (blue water lily). Above her head is shown a miniature *stūpa*.

An elevated tract in the eastern part of the village is still known as the *Rājbarī* (palace) by the local people. The whole area, now full of brickbats and potsherds, has been under plough for years together and the area and elevation are annually being reduced. Report goes that bricks can be obtained in enormous quantity from this place by a little digging. The size of these bricks, if the local people are to be believed, are unusually large. Several big bricks, now forming a sort of platform round a well in the house of a cultivator, are reported to have come from the *Rājbarī* mound and they measure approximately 13" × 12" × 3". Further east, just by the side of the Gājol road, there is the *thān* of Śmaśānakālī, where there are a few fragments of images including a sandstone liṅga. In the *thānā* (Police Station) compound there are also several images, of which one of Sūryya and another of Mahishamarddini are worth noticing.

#### BHADRAŚILĀ.

About a mile to the east of Itāhār lies the big village of Bhadraśilā, undulating throughout, containing large but low mounds full of bricks and stones. The most curious thing is that the whole area of the village, comprising about 2½ miles by 1 mile, is covered with bricks and stones. A quarter of a mile to the east of the Gājol road there rests under a banyan tree a much mutilated image of Aghora-Rudra, now known to the local people as Durgā Mahishamarddini. It is under so-called worship, the god receiving a few flowers and water only on a few days of the year. Otherwise it is quite neglected, lying at the mercy of the weeds and hanging roots of the banyan tree, which have almost shielded the image from public gaze. The front of the image has been nearly completely chipped off. The god stands in *pratyāñidha* (archer's pose) trampling under his feet two demons, whom he is fighting to destroy. In this act he is also being assisted by his bull, which, standing on the prostrate body of one of the demons, tears his chest with its horns. The god is three-eyed and eight-handed, and among the weapons, bow and arrow, sword, trident, shield, etc. can still be recognized. The slab is rounded with an incised scroll at the edge. In point of execution it can be dated in the 10th century A.D. This representation corresponds to two *dhyānas* of the god occurring in the *Prapañchasāra* and *Śāradātīlaka tantras*. This particular form of Śiva is rather rare and the present image, barring minor differences, is identical with a similar specimen from Ghatnagar (Dinajpur District) in the Museum of the Varendra Research Society, Rajshahi (Sanyal, N. B., *Aghora-Rudra, Monographs of the V.R. Society, Rajshahi*, No. 5, pp. 30-34, fig. 9) and another in the Dacca Museum (Bhattasali, N. K., *Iconography of Buddhist and Brahminical sculptures in the Dacca Museum*, Pl. XLVIII, fig. a).

From Aghora-Rudra I passed due east along a brick-strewn path to see the shrine of Bhadrā and Bhadrī, from which, according to the local people, the name of the village has come. The *thān* of Bhadrā is a small dilapidated temple, of which the walls to some extent and the floor are still preserved. Some stones have been used in the construction of the plinth, and on the floor can be seen an image lying in three fragments. It appears to be an image of the Sun-god *Sūryya*. The shrine of Bhadrī, situated under a bush a little further on, contains another sandstone image of the same god, of an earlier date (c. 9th century A.D.). There is still another shrine within the village, that of Dakshinakālikā, where an image of the river goddess Gaṅgā, gracefully standing on the back of her vehicle, the Makara, represents to the people the Dakshinakālikā, after whom the shrine is named. Though mutilated (both hands of the goddess and the mouth of the Makara being gone and faces of all the figures abraded), the sculpture is worth more than a passing notice for its elegant and graceful workmanship. The image was to some extent entangled in the roots of the tree, under which it was placed and it was with much difficulty that I was able to extricate it. But for this timely intervention, the image, I am afraid, would have been broken to pieces under pressure of the tree within a year or two, and a pleasing specimen of Bengal art would have been lost for ever. There is, I am told, a big *jagir* for this shrine. Yet the people are so superstitious and apathetic that they would not do anything to save the deity from ruin and destruction. To them this interference on my part was sacrilege, and, instead of helping me in the least, the crowd that gathered waited breathless for some miraculous thing to happen to prevent me from performing this irreligious act. How many valuable relics are thus gradually being lost to us! Everywhere it is the same story. In each ancient site there is a *thān* (open shrine) or two, where every image found in the locality is deposited. The images are thus under so-called worship, receiving a few flowers and water a few days in the year, and as such are too sanctified to be removed elsewhere. In reality there is no proper worship, no proper arrangement for their protection from sun, rain or other natural agencies, or even from the vandalism of the image breaker. Under these circumstances, the relics, that lie scattered in distant villages, are gradually being lost to us and it is time that we should strive in earnest for their removal to a public museum or at least for their better preservation and protection.

The goddess (Pl. 1, Fig. 2) stands in slight *tribhaṅga*, and in three quarter profile on the back of her vehicle, flanked by two female attendants, of whom, one to the proper left holds an umbrella over her head, while that to the right fans her with a flywhisk. On the back portion of the slab may be seen the usual *Gajasimha*, the throne-back with the *makara* lintel, *kinnara* and

*kinnarī*, *vidyādhara* couples and the *kīrttimukha* top. The goddess has the usual ornaments. but the grace of form and the elegance of pose are not overshadowed by the exuberance of decorative details on the background—the characteristic feature of the art of the 12th century A.D. to which period the image may be assigned from stylistic indications. The name Bhadrāsīlā is interesting, but my enquiries have failed as regards any tradition regarding the origin of the name. Whatever the origin, there is no doubt as regards the antiquity of the village. The extensive elevated tracts, as hard as rammed concrete from accumulation of brickbats on the surface. the finds of numerous bricks on a little digging, fragments and images lying scattered around the village, abundance of north-and-south tanks (Sarai *dighi*. the big tank just by the side of the Gājol road, is, however, east to west) and last, the peculiar name of the village (*cf.* Takshasīlā) all point to an unmistakable Hindu antiquity of which further traces and materials for its ancient history are expected to be unveiled on proper exploration and excavation of the site.

#### BANKUR.

Bankur is a little village on the Raigunj road about 2 to 3 miles north-east of Itāhār. Just on the outskirts of the village there rests under a tree a big image of Sūryya, remarkable for its elegant execution and perfect preservation. The usual attributes and attendants—such as the two lotuses with stalks (*sanālapadma*) in two hands, Daṇḍi, Piṅgala and the two queens, the seven-horsed chariot, etc.—of Sūryya all conform to the śāstric injunction, and in point of execution it is an exact parallel to the Baghaura image of Vishnu, dated in the third year of King Mahīpāla I of Bengal. On that account it can safely be dated towards the end of the 10th century A.D.

#### SONĀPUR.

A little to the north of Bankur at a place called Bāgbārī a road bifurcates from the Rāigunj road towards the north-east, and passes through Chāloneā, Bānboil, Sonāpur, etc. to meet the Churāman-Kāliyāgunj road, which crosses the Rāigunj road at Durgāpur, further to the north. This road, known as the Mukhdum road, has traces of brick pavings on it. At Sonāpur there are several smaller mounds and the arer is undulating throughout. The village shrine is known as the *Navadurgār thān* (i.e. the shrine of Navadurgā) and contains a number of ancient images, such as Umā-Maheśvara, Vishnu, Gaurī, Mother and Child, etc. According to the *Rupamaṇḍana*, Gaurī is a general appellation for the placid form of Durgā. She has a mongoose (*Godhā*) as her vehicle (*cf.* *Godhāsanā bhaved = Gaurī*). She has several particular forms such as Umā, Pārvatī, Lalitā, etc. according to the variations of the attributes held in the

hands. This particular specimen at Sonāpur has a mongoose carved on the pedestal. The goddess stands upright on the open lotus, flanked by Gaṇeśa and Kārttikeya, and has four hands. The lower right hand is in *varada* (gift bestowing pose), upper right holds *akṣamālā* (rosary) and Śivaliṅga (phallic emblem of Śiva), upper left *triśūla* (trident) and the lower left *kamaṇḍalu* (waterpot). Flames of fire are incised on her two sides. Such images are rather common in North Bengal, the Museum of the Varendra Research Society alone possessing four or five specimens, and I have noticed others lying uncared for in many of the ancient villages of Varendra. From the description it appears that these images correspond to the particular form of Pārvatī, whose *dhyāna* is thus given in Hemādri's *Vratakhanda*, Vol. I, pp. 86-87.

*Akṣhasūtram Śivam devam Gaṇādhyakṣam kamaṇḍalum |  
Agnikuṇḍadvayam pārśve Pārvatī parvatod-bhavā ||*

Gaṇeśa of course is absent as an attribute in the present image but he appears as one of the attendant figures. It is probable that this image was the principal deity in the *thān*. The *thān* itself consists of a square platform built of older materials on a mound. Close to this there is again a smaller platform, which also contains several hopelessly mutilated fragments. Of these, the bottom of a pilaster (?) is worth noticing for its bold and elegant mouldings.

Just to the east of the road there is a high mound full of bricks, and at the foot of it there are two images of Sūryya of fairly early period. They are executed in relief on asymmetrical slabs of coarse-grained sandstone, now badly weathered, and the smaller one closely resembles in style another image of Sūryya dated in the 26th year of king Dharmapāla (*A.S.I., Ann. Rep.*, 1908-09, p. 148, fig. 3). From stylistic indications therefore, it is assignable to the eighth century A.D. In each of the specimens (Pl. 2, Fig. 3) Sūryya stands on a low plinth between two attendants, Daṇḍi and Piṅgala, and is dressed in a low flat cap and a long tunic fastened at the waist with a string belt. His articles of jewellery include earrings, necklace and bracelets, and he and his attendants have high boots. The hair falls in ringlets over the ears. As usual he holds a pair of lotuses, but the two queens, the horses and the charioteer, Aruṇa are not shown. The bigger image shows us a comparatively slender and taller figure, and is probably a little later in date.

About three quarters of a mile to the south of *Navadurgār thān*, on the high embankment of a tank (north-and-south) there was a mutilated image of Revanta, worshipped by the local Muhammadans as *Ghodāpīr*. It is well known that in Varāhamihira's *Bṛihat Saṃhitā*, Revanta, the son of Sūryya, is described as mounted on horseback accompanied by a hunting party (cf. *Revanto 'śvāruḍho-mṛigayākrīdādīparivārah*—Chap. 57,

verse 56). The present image (Pl. 2, Fig. 4) conforms to this description of Varāhamihira. The base of the sculpture exhibits a frieze of dancing musicians, a bowman and boar. Above this, Revanta is represented in profile, mounted on a caparisoned horse. His right foot on the stirrup rests on the head of a boar, while another boar is being trampled upon by the horse with its front foot. In his right hand the god holds an uncertain object (perhaps a cup with a lid), and in the left the reins. This may represent *madhupātra* (cup of honey) which the god is sometimes enjoined to bear. An attendant from behind raises an umbrella over his head (now missing). This indicates his royal rank. Four other attendants, with various weapons for the hunt, accompany the god. It is carved in black basalt and appears to date from the 10th century A.D. The treatment of the bodily form is characterized by vigour and energy, and all the figures indicate a clear understanding of pose and movement. A little to the south of this tank there is the *āstanāh* (abode) of *Ghoḍāpīr*, where, among hundreds of clay images of horses and elephants, may be seen a fine black basalt image of Kārttikeya, the god of war, seated at ease on the outstretched wings of his vehicle, the *mayūra* (peacock).

### YOGIPĀRĀ.

The road to Bāigungaon starts from the Itāhār-Patirāj road a little to the east of Bhadrāsīlā and runs south. It is known as the road of Sevakram Chaudhuri, a fabulously wealthy resident of Bhadrāsīlā according to local tradition, who constructed this road about a hundred years ago for easy communication to Bāigungaon. The last-named place was a great trade centre in those days, and its Rānī, Dayāmayī Chaudhurānī, was an intimate acquaintance of his. The village of Yogipārā lies just contiguous to Bāigungaon on the north. By the side of the road there is the shrine of Śmaśānakālikā, where an image of the fierce god Bhairava, lying under a tree, is pointed out by the local people as Śmaśānakālī, the presiding deity of the *thān*. In a hut close by there are three rather large images—two of which represent the Sun-god *Sūryya*. Indeed it appears that in this part of the country the cult of *Sūryya*, as contrasted to that of Vishṇu, was widely prevalent. Such an inference is clearly demonstrated by the presence of numerous images of the Sun-god or images concerned with his cult throughout the particular area that I selected for my present trip.

A quarter of a mile to the east of this *thān* was found a grey sandstone image of Buddha, half buried under earth, on the bank of a tank, much overgrown with jungle. The image is locally known as 'Bhairo Bābā' and the story goes that a person afflicted with deafness can be cured if he smears the image with mud and weeds of the tank. On recovery he is enjoined to

wash the image clean and to dedicate some offerings (generally some fruits) to the deity. The image (Pl. 3, Fig. 5) is fairly early in date and shows the god seated in *bhūmisparśamudrā* (earth-touching attitude), which signifies his enlightenment at Bodhgayā. I dug out the image in search of an inscription, which, however, is wanting; but, from stylistic indications and from its simple but elegant execution, the image can on no account be dated later than the ninth century A.D.

#### BĀIGUNGĀON.

The village of Bāigungāon, six miles from Itāhār to south-east, is known as the residence of Rāṇī Dayāmayī Chaudhurāṇī, still in living memory. Her husband's name was Ramprasad Sinha, but she was widowed very early in life. According to some she had a daughter, while others say that she was childless and adopted a son, who, by his reckless expenditure, ruined the property. The original residence of the family was somewhere in the Murshidabad District, perhaps Jajān in the Kandi subdivision. The palace of the Rāṇī is still to be found covered with thick jungle and in ruins. Just in front of the palace there is a big tank (N×S) known as *Rāṇī dighi* or the Rāṇī's tank, where, the people say, there was a large marble stool (used by the Rāṇī for her bath), which was removed by the Ghughudanga Zemindars. In my previous report I recorded the tradition ascribing all the neighbouring ruins, such as Mahendra, Surohor, etc. to the Rāṇī of Bāigungāon. But she was certainly a recent character, and Bāigungāon itself contains nothing of pre-Muhammadan antiquity, except a sandstone image of a Liṅgam with Śaktis (c. 9th century A.D.—For a description reference may be made to the previous report, *J.P.A.S.B.*, Vol. XXVIII, 1932, p. 189), which again might have come from some place in the neighbourhood. The tradition ascribing the neighbouring ruins, which are certainly pre-Muhammadan, to Bāigungāon is thus obviously wrong. In Rennell's Map the place seems to have been an important one. Several roads from different directions converge at this point. One road from Panduah, running north from Myna and Bygongong to Meerjaserra(i), and then, turning east, leads to Dinajpur and Rungpur. From Meerjaserra(i), this road bifurcates towards Hemtabad. From Bygongong another road runs due west to Churāman and thence, with a little bend towards the north-west, goes ultimately to Purneah. Though it is a little difficult to trace all the alignments of these old roads, some can still be traced, and the present roads in many places closely follow the old alignments.

#### SHĀDEĀ.

It is a big village on the river Chirāmatī, some two miles to the north-east of Bāigungāon. This village has also an



ancient appearance, with small mounds and brick-strewn undulating tracts. There are two shrines in the village where images and other stones can be found. The shrine on the river bank is on a high mound where architectural stones can be traced here and there. Of the images, which are not many, two are worth mentioning. One is a big torso of a mutilated image of Tārā of beautiful workmanship, and the other is a miniature image of Revanta in grey sandstone, very badly weathered and dating from about the ninth century A.D. The god rides a horse, which bends down under his weight, with the left hand holding the reins and the right swinging the lash, to goad on the charger. Only one attendant appears on this slab holding an umbrella over the head of the god.

Within the village there is another shrine where there are a fair number of images, mostly mutilated. Of these only two require a passing mention. One is a miniature image of Sūryya in sandstone of about the ninth century date. It is much abraded, and the iconographic details correspond to those of the two images from Sonāpur. The other (Pl. 3, Fig. 6) is part of a grey sandstone frieze with three figures—two male and one female—on horseback. The male figures hold swords or staves in the right hands, and reins in the left. The female holds reins in the left and an uncertain object in the right. All the figures appear to have umbrellas over their heads. Other details, if any, have disappeared, and it is difficult to ascertain the iconographic identity of this group.

In my third tour (March, 1933) I visited Surohor, about two miles south of Shādeā, and Mahendra, just opposite to Surohor beyond the river, where I found numerous sculptures, of which a few proved to be quite unique (*J.P.A.S.B.*, Vol. XXVIII, pp. 190–194, pl. 8, figs. 3 and 4, pl. 9, fig. 1). In the present trip (March, 1935) I again visited the two places and was shocked to find almost all the sculptures, that I found entire during my previous visit, battered to pieces. Strange to say, the local people, who regard these stones as so many sacred properties of the village and do not allow any one to remove them elsewhere, profess to know nothing as to who perpetrated this heinous crime. The almost total destruction leaves no doubt that it was intentional and the work of some modern fanatic. It proves that the iconoclastic spirit of the early invaders is not yet dead. Rather, it has been strongly manifested of late, and unless we can arrange to preserve and protect the numerous relics, lying scattered and uncared for in the different so-called village *thāns*, from the hands of modern iconoclasts many of the priceless treasures of antiquity will soon be lost for ever.

#### DHULOHĀR.

Last, though not the least, I come to the village of Dhulohār (Dhōnhār of the Survey Map) four or five miles to the west of

*Itāhār*. To reach it one has to pass through Khāmārooā, just contiguous to Itāhār to the west, on the opposite bank of the river Chāmār. At Khāmārooā there is a small black stone image of Sūryya preserved in the Kālibāri, while a big Navagraha slab is hopelessly entangled in the roots of a large banyan tree in the eastern outskirts of the village. Almost the whole of the slab is now in the coils of the roots, only a small portion, containing the Gaṇeśa and some part of the Sun-god, being visible.

The site of Dhulohār appears to be a very important one. It is a vast elevated area of about two miles by three miles covered with dense jungle, which is impossible to penetrate into without the help of elephants. The slopes of this elevated tract are gradually coming under plough and are literally strewn over with brickbats and pots-herds. The old people of the locality affirm that in the jungles there are big tanks and innumerable *pāshāṇas* and bricks. Just to the east of the site there is a vast tank about half a mile in length. From it two ditches, one in the north and the other in the south, have joined the Kulik river, running by the west side of the site, thus encircling and forming a sort of fortification for the entire area. Paved brick-on-edge streets can be traced and there are remains of a pucca *ghāt* on the river. I visited a small mound on the western slope of the site, where the jungle has recently been cleared by the villagers for using the mound as a *thān*, and another on the opposite bank of the river just by the side of the Durgapur-Churāman road, both full of bricks and stones.

A tradition is widely prevalent that the site of Dhulohār was the capital of one Dhulpaṭ Rāj, the exact time of his reign being unknown. The highest peak of that elevated site is known, according to local tradition, to be the palace of that monarch. The tradition is so strong that it is said that an image of Viṣṇu, found in that area, bore the name of Dhruṇpāl Rājā (from which the corrupted Dhulpaṭ Rāj), who was alleged to be connected with the Pāla dynasty of Bengal. I however could not find the image in question, and there are grave doubts whether really any such image bearing such a name had ever been found.

From the foregoing pages it is apparent that the area traversed during this short trip was once full of ancient and prosperous settlements adorned with imposing palaces, beautiful temples and large tanks. Its ancient magnificence is now a thing of the past, and its history has been lost and buried in oblivion. The whole tract is now a mere woodland of ruined mounds and half-silted-up tanks. The relics that lie above ground fully demonstrate the antiquity and importance of the different sites, which, if properly explored and excavated, are expected to yield valuable and interesting results for the history of this part of the country, and, it may be, even for the history of Bengal.

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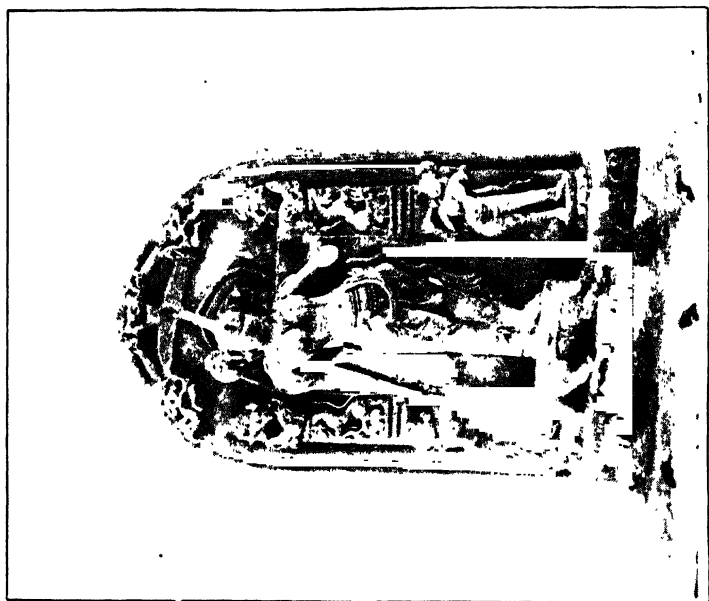


FIG. 2. Gangā (Bhadraśīlā).



FIG. 1. Yogāsana Vishnu (Hābār).





FIG. 4. Revanta (Sonāpur).

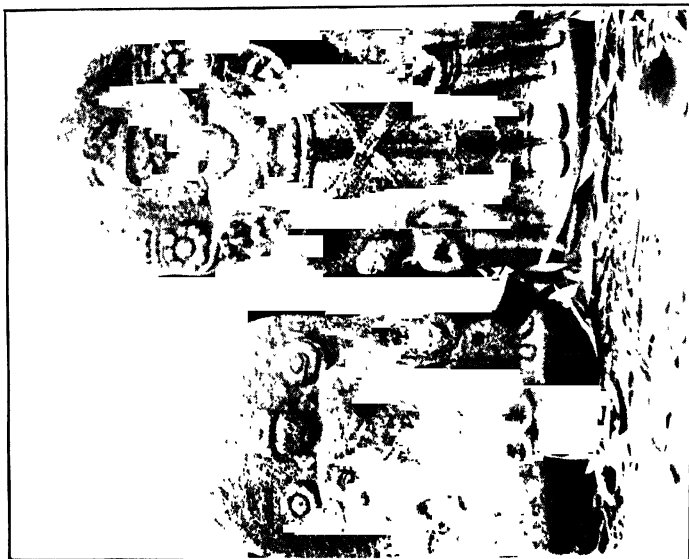


FIG. 3. Sūryya (Sonāpur).





FIG. 5. Buddha (Yogipāra).







## Two Inscriptions from Barakar.

BY S. N. CHAKRAVARTI.

The two inscriptions under discussion are written on the right door-jamb of the Gaṇeśa temple in the Begunia group of four temples at Barakar in the District of Burdwan. The temples were first described by Beglar in 1872-73<sup>1</sup> and subsequently by Dr. Bloch in 1902-03.<sup>2</sup> An account of the epigraphs was given by Mr. K. N. Dikshit in 1922-23.<sup>3</sup> I now edit them for the first time from an ink-impression kindly lent to me by the Superintendent, Archaeological Survey, Eastern Circle. For a number of suggestions I am indebted to Dr. R. G. Basak, M.A., Ph.D., Senior Professor of Sanskrit, Presidency College, Calcutta.

The inscriptions are dated. The earlier of them gives Wednesday, the eighth of the bright half of the lunar month Phālguna in the Śaka Year 1383 counted by the figures represented by *nētra* (3), *vasu* (8), *tri* (3), and *chandra* (1). Dr. Bloch took this date to correspond either to the 18th February, or to the 4th March, 1462 A.D. Mr. K. N. Dikshit has, however, correctly shown that it corresponds to the 18th February, 1461 A.D. The second inscription is dated Wednesday, the seventh of the bright half of the lunar month Agraḥāyana in the Śaka Year 1468 counted by the figures represented by *vasu* (8), *rasa* (6), *samudra* (4), and *chandra* (1). The equivalent English date works out as the 29th December, 1546 A.D.<sup>4</sup>

The inscriptions are important on palaeographical grounds. The earlier of them shows final changes leading up to the modern Bengali writing in the other. It is worth mentioning here that on the style of the characters Chandidāsa's Kṛṣṇakīrtana in the collection of the Vaṅgiya Sāhitya Parishat can be assigned to the date of the first inscription and Raghunandan's Dharmapūjavidhi in the collection of the Royal Asiatic Society of Bengal, which has been assigned by Mahamahopadhyaya Haraprasad Sastri to the early nineteenth century, to that of the second one.

The first inscription, which covers a space of about

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<sup>1</sup> Cunningham's Archaeological Survey Report, Vol. VIII, pp. 150 ff.

<sup>2</sup> Annual Report of the Archaeological Survey, Bengal Circle, 1902, p. 29; 1903, p. 13. See Sarasvati, *J. Ind. Soc. Ori. Art.*, I, p. 114 f.

<sup>3</sup> Annual Report of the Archaeological Survey of India, 1922-23, p. 110.

<sup>4</sup> See L. D. Swamikannu Pillai, *Indian Ephemeris*, Vol. V, p. 295.

1' 6" × 0' 7", is in 12 lines in fairly good script ; the second one, which occupies an area of about 2' 3" × 0' 7", is in 21 lines in very cursive script.

The characters of the inscriptions are Bengali. The palæography calls for some remarks. The length of the initial *ai*, as in *aīsaṁ* (ll. 6-7), is denoted by adding the curved upward stroke to the vertical straight line, which stands on the right side of the main body of the letter. The two limbs are joined by a short horizontal line, which is slightly slanting. Not infrequently the *i*-mātrā is expressed by a full length vertical straight line joined to the left end of the top line, as in *sītē* (l. 15). The old forms of the *u*-mātrā by a curve to the right or a hollow triangle to the left attached to the lower extremity of the letter, still survive, as in *guṇitē* (l. 2) and *puṇyē* (l. 3). In *ru*, as in *ruchiraṁ* (l. 4) and *gurudvīne* (l. 17), the sign for the vowel-mark of *u* is the precursor of the modern Bengali one. The *ū*-mātrā, as in *bhūriśrīyō* (l. 9), is indicated by a curve to the left, which is attached to the lower extremity of the letter. The *anusvāra* with only a small circle above or below the top line and on the right side of the letter is still to be seen. The modern Bengali sign is found in *dēvakulaṁ* (l. 7) and *phalaṁ* (l. 11). In *dēvaṁ* (l. 26) the *anusvāra* is, however, indicated by the old form of the letter *ma* (cf. Buhler, Table III), which is placed below the sign for the *anusvāra* in *pryāṁ* (l. 25) in the immediately preceding line, surely for want of space. It may be mentioned here that the top line of *pa* in *pryāṁ* (l. 25) is also placed after the sign for the *anusvāra* in *Harapadaviditāṁ* (l. 24) in the immediately preceding line. The peculiar forms of *ka*, as in *dēvakulaṁ* (l. 7) and *vīprakulē* (l. 20), and *khaṇḍita ta*, as in *tat* (l. 31), call for notice. Other peculiar forms are *nda*, as in *chanda* (l. 14) and *Nanda* or *Nanda* (ll. 22, 27), *ccaiḥ*, as in *uccaiḥ* (l. 11), and *śrī*, as in *Śrī Nandanāmadhēyāṁ* (ll. 21-22). In *ccaiḥ* the sign for the half-visarga, which is of the *upadhmanīya* class, is joined to *ccai* by means of a hyphen in the middle. In the first inscription *na* and *ṇa* are distinguished. The dental *na* has the modern Bengali form of the letter and the cerebral *ṇa* is the modern Bengali *la* without the top line. In the second inscription the same form is used for *na* and *ṇa*. We find, however, two forms of the dental *na* :—(1) the modern Bengali form, (2) the old form in which the loop has become separated from the main body of the letter and attached to the right vertical straight line by a short horizontal straight line, as in *nṛpatē* (l. 29). No difference is made, as is the case even in much older records of Bengal, between *ba* and *va* in either record. There occur three different forms of *ra* :—(1) with a dot inside the triangle, as in *Haripriyā* (l. 10) ; (2) with a slanting cross-bar, as in *Hara* (l. 18) ; (3) without a dot or a cross-bar, as in *Hariśchandraśya* (l. 8). The *repha* is indicated, as in modern Bengali, by a slanting upward stroke (*mārgagē*

in ll. 15-16). The *ta*-shaped form of *la* has been used in all cases. The palatal *śa* in the first inscription differs but little from the modern Bengali form of the letter. The separate curve attached to the lower end of the left limb has changed into two small circles. But the two semi-circles in the upper part of the letter are still to be seen.

As regards punctuation we find that in the first inscription the *Ardhaviṛāma*, i.e. half-stop, is indicated by a full length vertical straight line and the *Pūrṇaviṛāma*, i.e. full-stop, by two similar straight lines. The second inscription does not, however, show these marks.

The language is Sanskrit. The first inscription consists of a single verse and the metre employed is *Śārdūlavikrīḍita*. The second inscription consists of two and a half verse. But it is so corrupt that the lines cannot be scanned. The metres employed seem to be *Śragdharā* in the first verse and *Anuśtubh* in the remaining one and a half verse.

There are several mistakes of orthography in the second inscription. Thus we find *r* for *ri* in *pryām* (l. 25); *n* for *ṇ* in *ganitē* (ll. 14-15) and *punyē* (l. 18); *s* for *ś* in *sākē* (l. 13) and *vishvēsari* (l. 25); *s* for *śh* in *bhaviṣyati* (ll. 30-31); *śh* for *ś* in *shivapadē* (l. 21) and *vishvēsari* (l. 25); *tr* for *rtt* in *kitri* (ll. 30, 31, 33); and *sv* for *sy* in *tasvī* (ll. 22-23). We find, however, only two instances of incorrect orthography in the first inscription, viz. *n* for *ṇ* in *Phālguṇē* (l. 6); and *ś* for *s* in *Harīśchandraśya* (l. 8).

There are also several mistakes of grammar in the second inscription. To mention a few of them here: *nṛpatē kitrim* for *nṛpatēḥ kīrtti* (ll. 29-30); *kitrim lupṭa* for *kīrttilupṭā* (l. 30); and *kitri karōmyaham* for *kīrttim karōmyaham* (l. 33). In the first inscription we find, however, only one mistake of grammar, viz. *phalam prāptayē* for *phalaprāptayē* (ll. 11-12).

The first inscription mentions the erection of a temple of the god Śiva by Haripriyā, the beloved wife of the lord of the earth Harīśchandra; the second one records the restoration of the said temple by a Brahmin named Nanda, who seems to have been a votary of the god Mādhava but whose beloved wife Viśvēśvari is reputed to be the follower of the feet of the god Hara.

The inscriptions do not contain any information of historical interest. We find, however, the names of a lord of the earth and his wife. But who the lord of the earth Harīśchandra and his wife Haripriyā were we do not know.

The only geographical term mentioned in the inscriptions is Śivapada. It is not improbable that the place where the four temples have been found was formerly called Śivapada after the name of the god Śiva in whose honour a temple had been first erected and afterwards restored. The modern name of the place seems to have been derived from the discovery of big mines (coal) in its neighbourhood.

## TEXTS OF INSCRIPTIONS.

## PLATE 4.

[Metre : V. 1, Śārdūlavikrīḍitam.]

1. Ōm ॥ (Śā) kē nētra-va-
2. su-tri-chandra-guṇitē <sup>1</sup>
3. puṇyē budhāhē ti-
4. thāvashtamyām ruchiram
5. pratishthitavati pakshē
6. sitē Phālgunē <sup>2</sup> | Ai-
7. śam dēvakulam yathā
8. vidhi Hariśchandraśya <sup>3</sup>
9. bhūriśriyō bhūśakra-
10. sya Haripriyā priya-
11. tamā uccaiḥ phalam <sup>4</sup> prā-
12. ptayē ॥ [1\*]

## PLATES 5-6.

[Metres : V. 1, Śragdharā (defective) : VV. 2-3, Anuṣṭubh (defective).]

13. Sākē <sup>5</sup> vasu-
14. rasa-samudra-chanda <sup>6</sup>-gani-
15. tē <sup>7</sup> pakshā <sup>8</sup> sitē mā-
16. rgagē <sup>9</sup> saptamāñcha <sup>10</sup>
17. gurudvinē <sup>11</sup> prati-
18. shthita <sup>12</sup> Hara <sup>13</sup> puṇyē <sup>14</sup>
19. budhāhē bhuvi [1] tēsām <sup>15</sup>
20. viprakulē kulava-
21. tām Shivapadē <sup>16</sup> Śri-
22. Nandanāmadhēyam <sup>17</sup> ta-
23. svā <sup>18</sup> bhārjyāti <sup>19</sup> pakshā <sup>20</sup>
24. Harapadaviditām <sup>21</sup>
25. Vishvēsari <sup>22</sup> tatpryām <sup>23</sup> ॥ [1\*]

<sup>1</sup> Read Ganitē.<sup>2</sup> Read Phālgunē.<sup>3</sup> Read Hariśchandraśya.<sup>4</sup> Read Phala°.<sup>5</sup> Read Sākē.<sup>6</sup> Read °Chandra°.<sup>7</sup> Read Ganitē.<sup>8</sup> Read Pakshē.<sup>9</sup> Read Mārgakē.<sup>10</sup> Read Saptamyāñcha.<sup>11</sup> Read Gurudinē.<sup>12</sup> Read Pratishthitah.<sup>13</sup> Read Haraḥ.<sup>14</sup> Read Puṇyē.<sup>15</sup> Read Tēshām.<sup>16</sup> Read Śivapadē.<sup>17</sup> Read dvijaḥ instead of °dhēyaḥ.<sup>18</sup> Read Tasya.<sup>19</sup> Read Bhāryēti. Iti is superfluous.<sup>20</sup> Read Pakshaḥ.<sup>21</sup> Read Harapadaviditā.<sup>22</sup> Read Viśvēśvarī.<sup>23</sup> Read Tatpriyā. Tat is superfluous.

26. Pranammam<sup>1</sup> Mādhavam dēvam
27. Nandvanāmadvi-<sup>2</sup>
28. janmanā [1] Hari-
29. schandrasya<sup>3</sup> nṛpatē<sup>4</sup>
30. kitriṁ<sup>5</sup> lupta<sup>6</sup> bha-
31. visyati<sup>7</sup> [1 2\*] tatkitri<sup>8</sup>
32. rakshanāthāya<sup>9</sup> pu-
33. na<sup>10</sup> kitri<sup>11</sup> karōmyaham [1]

## TRANSLATION OF INSCRIPTIONS.

## PLATE 4.

On the auspicious Wednesday, the eighth of the bright half of Phālguna in the Śaka year counted by the figures represented by *nētra* (3), *vasu* (8), *tri* (3), and *chandra* (1), Haripriyā, the beloved wife of Hariśchandra, the lord of the earth and possessed of great wealth, caused to be built a beautiful temple of Śiva according to the rites, for the attainment of high merits.

## PLATES 5-6.

On the auspicious Wednesday, the important day of sap-tamī<sup>12</sup> of the bright half of Mārgaśirsha in the Śaka year counted by the figures represented by *vasu* (8), *rasa* (6), *samudra* (4), and *chandra* (1), a certain (Brahmin) Nanda by name, (who is born) at Śivapada in the Brahmin family of those of noble birth and whose beloved wife Viśvēśvari is reputed to be the follower of the feet of Hara, caused to be built (the temple of) Hara. Having made obeisance to the god Mādhava it is resolved by the Brahmin named Nanda, 'The glory of King Hariśchandra will vanish (as the temple is out of repair). In order to preserve his glory again I will do the work (of repair) '.

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1 Read Pranamya.

2 Read Nanda°.

3 Read Hariśchandrasya.

4 Read Nṛpatēh.

5 Read Kirttir°.

6 Read °luptā.

7 Read Bhavishyati.

8 Read Tatkīrtim.

9 Read Rakshanārthāya.

10 Read Punah.

11 Read Kīrtim.

12 'Saptamyāñcha garudīnē' evidently means here 'on the important day' of mitra saptamī, sacred to the sun.





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Inscription in Bengali script (12 lines) on the right door-jamb of Ganeśa temple, No. I (1' 6" × 0' 7") at Barakar (Begunia), Dt. Burdwan. Top.

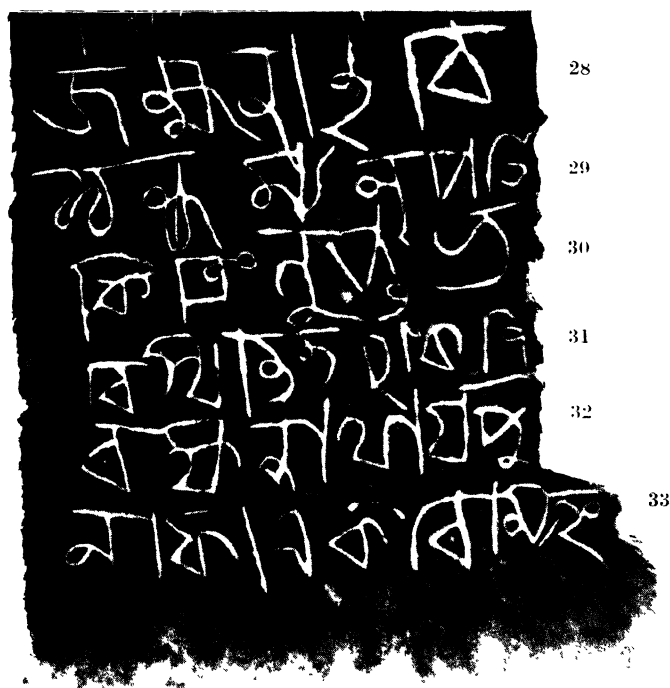




সাকিব	13
ব্রহ্মসিংহ	14
গোপাল	15
জগদীশ	16
শ্রী	17
বিষ্ণু	18
ব্রহ্ম	19
বিষ্ণু	20
ব্রহ্ম	21
ব্রহ্ম	22
ব্রহ্ম	23
ব্রহ্ম	24
ব্রহ্ম	25
ব্রহ্ম	26
ব্রহ্ম	27

Inscription in Bengali script (21 lines of which 15 lines are on this plate, and 6 on Plate 6) on the right door-jamb of Ganeśa temple, No. I (2' 3" × 0' 7") at Barakar (Begunia), Dt. Burdwan. Bottom.





Lower portion of Plate 5.



### **The Daflas and their Oaths.**

By N. L. BOR.

The foothills of the Himalaya in Assam between the Bhorelli and the Khru rivers are inhabited by a race of hill people known as Daflas to the Assamese. The origin of this name is shrouded in mystery and they invariably refer to themselves as Bengni (men). As far as is known this tribe extends northwards to the foot of the lofty snowcovered mountains known as the Se La range, but this is only hearsay and the country has not been explored at all.

The Daflas far within the hills are a fine independent race, but those nearer Assam have been spoiled by contact with the plains people. Malaria and dysentery have thinned out their numbers and undermined their robust constitutions, manifesting itself in reduced stature and loss of warlike spirit and manly independence.

The tribe has always been truculent and turbulent, and must have been a thorn in the side of the native rulers of Assam. One writer, Mahomed Zagin, during the reign of Aurungzeb, remarked 'The Daflas are entirely independent of the Assam Raja, and whenever they find an opportunity they plunder the country contiguous to their mountains'.<sup>1</sup>

The Assam kings seem to have resigned themselves to the fact that they were powerless to prevent raids by the hill people and for that reason the taxes demanded from plains villages close to the hills were much lighter than in villages more remote. In fact it was recognized by the British that the Daflas had acquired a right to levy tribute in the plains and in 1852 the Court of Directors insisted on this 'posa' being commuted for an annual money payment. This arrangement continues in force at the present day.

The tribe is divided into two sections, the western 'Yanno' and eastern 'Tagen'. Each section is divided into a very large number of exogamous clans or *nyebus*. A lofty ridge running north and south in the centre of the Dafla country may be taken as the dividing line between these two sections, who differ markedly in dialect and custom. The dress of the two sections is however the same.

The Dafla village consists of few houses, but they, especially that of a chief, are of immense size, and shelter many families, each of which has its own hearth and sleeping space.

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<sup>1</sup> *Gazetter of the Balipara Frontier Tract.*

The tribe as a whole is not united, but groups of villages form loose alliances and unite in times of danger. Murder and slave-taking are very common in villages 3 or 4 marches from the plains and the usual *casus belli* is the spread of disease within the hills. Any village near the plains is suspect, as the disease is invariably carried up to the hills from the plains, and the Daffa sanitary conditions being what they are it is not surprising that a disease such as dysentery causes dreadful mortality.

When an enemy is killed the head is usually cut off but is not carried away, but the right hand is severed at the wrist and taken to the raiders' village, where it is attached to a tree, palm outwards, by means of a cane thong. The raiders then gather round and discharge arrows at it.

The dress of a Daffa male is simple, consisting merely of a 'lengta', while on his head he wears a cane hat decorated with hornbill feathers. The hair is parted behind and plaited, the two plaits being then tied in a knot above the forehead and transfixed with a brass pin. The dress of a woman is simply a cloth wrapped round the body. The women wear a woven cane anklet (*lorung*), so tight that the flesh bulges above and below; corresponding to the *lorung* the male wears a tight band of cotton (*lekung*) below the knee. It is believed that the *lorung* and *lekung* enable them to climb hills.

Their arms are a long spear, 'dao', bow and arrows, the latter often being covered with aconite just below the barb. Guns are much prized and valued by villages on the outer ranges for the protection they give against raiders from within the hills.

The method of cultivation is 'jhuming' and in some places, e.g. Panir river valley, is supplemented by irrigated terrace cultivation. The usual hill crops are grown and in addition opium is cultivated in common with all the tribes on the northern frontier of Assam. The cultivation of the opium poppy is likely to increase when the hillman learns what a profitable market lies to his hand in the province of Assam, where the sale of opium is being restricted.

The flight of slaves from the hills and the subsequent raids carried out by their enraged owners led to a Daffa settlement being established in 1918 at Charduar, the headquarters of the Balipara Frontier Tract. Here are collected a heterogeneous collection of scallywags, runaway slaves and those who have made the hills too hot to hold them, all of them under the control of a Political Officer.

As mentioned above these Daffas and those in readily accessible villages are about to be, or have become, demoralized by contact with the plains and there is great danger of their traditions and customs being lost.

It is surprising how little is on record concerning this

interesting people, whose customs are not less interesting than those of any other Assam hill tribe with whom the general public is familiar, thanks to the series of monographs on the hill tribes published by the Government of Assam. It is not improbable that in the future the inner hills may become even less accessible than they are now, and the author of this paper believes that the danger of information being lost altogether will be the justification for an amateurish attempt to put on record an account of some of the Dafla customs.

#### THE OATH AMONG THE DAFLAS.

Among uncivilized peoples who live in constant dread of evil spirits the taking of an oath is of considerable interest on account of the light it throws upon their religion and beliefs.

The Dafla lives in a world of malignant spirits which are liable to attack him at any moment. Any disease is put down to the influence of some spirit or other. For this reason the *nyebu* or sorcerer, who lives in intimate contact with the spirit world, is a man of very considerable power and is called in upon every conceivable occasion when trouble threatens. His fees are high and the ceremonies he performs to exorcise a troublesome spirit often entail considerable expense to the sufferer.

A good deal of the information in this account of the Dafla oath was given to me by Karu Welli, a *nyebu* of great repute among the Daflas. The awe with which he is regarded is not unmixed with fear on account of his alleged power of casting spells. The belief is so real that few people will speak ill of him for fear that they will be visited by some misfortune.

The stock in trade of a *nyebu*, which is often used in administering oaths, consists of the following :—

1. *Senyo fi* (Tiger's tooth).
2. *Hati supin* (Elephant's hide).
3. *Burru supin* (Water snake's skin).
4. *Chègé* ('Dao').
5. *Nengko* (Spear).
6. *Mâklung* (Core of a thunderbolt).
7. *Öpök* (Arrow).
8. *Râktik* (Arrowhead).
9. *Upno* (Aconite).
10. *Kamin ishi* (Water from the Bhorelli).
11. *Yamdök* (Chilli).
12. *Eleng* (Stone).
13. *Hâpök* (Chicken liver).
14. *Mamupodurung* (*Laportea crenulata*).
15. *Sengrit* (Branch of *Ficus rhododendrifolia*).



The association of ideas which leads to the use of most of the above articles will be obvious but there are some that require further explanation.

*Burru supin*—Water snake skin. All people who are drowned in the Bhorelli are supposed to be carried away by a large species of snake called *Burru*. Karu showed me a piece of skin which he said was that of a *Burru* and told me that on one occasion, many years ago, he was near the Brahmaputra, when a Sahib shot one of these snakes. The piece of skin which was produced before me was almost certainly part of a crocodile's skin. He strenuously denied that it was from the skin of a 'ghariyal', or fish eating crocodile, and stated that the 'water snake' he saw had a blunt snout. It is very probable therefore that the crocodile he saw killed was a 'mugger' which, I believe I am correct in saying, is a very rare visitor to the Brahmaputra river.

*Máklung* or core of a thunderbolt. These stones are common in the hills and are said to be found in trees which have been struck by lightning. The one shown to me was dark in colour and may have been meteoric in origin.

*Mamupodurung*. This is the Dafla name of the nettle *Laportea crenulata*, which gives a 'sting' of extreme severity; in fact so bad that it usually causes a rise of temperature or even delirium and the effects last for many days.

*Hâpok*—The liver or heart. The Daflas believe that the liver or heart is the seat of nearly all diseases, which are caused by an evil spirit or ghost biting or feeding upon the liver. The man who takes a false oath is particularly liable to have his liver attacked by such a spirit; hence the organ is regarded with considerable fear and awe.

*Sengrit*—*Ficus rhododendrifolia*. The tree is believed to be the abode of certain evil spirits and is called *Oyu Sengne* or 'Spirit tree' by the Daflas.

Of considerable interest to ethnologists will be the occurrence of the Y shaped sacrificial post (in the ceremony for swearing the *Sori dingdung*), used when a pig is decapitated. Among the Daflas the wood of *Laportea crenulata*, which occasionally grows to the size of a small tree, is used for the post.

Oaths fall into two classes :—

1. Those the result of which is not apparent for some time.
2. Those that demonstrate guilt or innocence at once.

Under the first heading come the oaths on the tiger's tooth, 'dao', spear, or water snake's skin and the *Sori dingdung*. Of these the most important is the *Sori dingdung* and this oath will not be taken lightly by any Dafla.

Under the second heading come the *Sodung dingdung* and *Râkderr dingdung* or ordeals by boiling water or red-hot iron.

In connection with these two oaths the man who comes through the ordeal unscathed has the right to demand *pafé* from the other party. This *pafé* is in the nature of compensation paid by the loser to the man who has won the contest for any possible danger he may be subject to on account of his temerity in taking the oath in the presence of a large number of evil spirits.

In the case of the first named oaths no *pafé* is awarded because if a false oath is taken the swearer is supposed to die by the object upon which he took his oath.

The only oaths about which a Dafla will think twice before he swears are the *Sori dingdung*, the *Sodung dingdung*, and the *Râkderr dingdung*. Any potential evil which may ensue from false swearing on the tiger's tooth, aconite, spear, 'daos', etc. can easily be charmed away by a simple ceremony which can be carried out without the assistance of a *nyebu*. Any case, therefore, of importance which is to be decided by oath must involve the swearing of one of the oaths mentioned above. The *Sodung dingdung* and the *Râkderr dingdung* are ordeals by boiling water and hot iron respectively and I have actually witnessed the former. In this particular case the guilty one was scalded, while the innocent man received no harm, although he thrust his arm up to the elbow into a 'chunga' of boiling water. Many are the authentic cases of retribution, in the form of death, following the false swearing of the *Sori dingdung* and I can personally vouch for two cases within my own experience.

Death following the false swearing of an oath has its parallel among many tribes and has been explained by the power of the primitive mind over its body, but how can one explain the victory of innocent flesh over boiling water and red-hot iron? This question can safely be left to the Pandits, and in the meantime a detailed description of the ceremony of the different oaths will be given.

#### SENYO FI DINGDUNG.

##### (Oath on tiger's tooth.)

Most hill tribes are accustomed to take an oath on the tiger's tooth, the supposition being that he who takes a false oath is liable to be killed and eaten by a tiger. Among the Nagas it is a very common form of oath and its reliability depends upon the length of time which has elapsed since somebody has been killed by a tiger. During my early dealings with Daflas I often settled a case by this method, i.e. by making one party swear on the tiger's tooth that what he said was true, the other party, *ipso facto*, losing his case. More usually both sides took

the oath and swore oaths that were diametrically opposed. In this case the two parties were carefully watched for 30 days and the first to have any loss, and it may be only trivial, loses the case.

There is no knowing how long I might have continued complacently to administer this oath had I not found, quite accidentally, that it is the easiest thing in the world to charm away any potential evil effects which might follow a false oath.

The method of swearing is as follows :—

The swearer, supposing he is accused of theft, takes the tooth in his right hand, says the following formula aloud and bites the tooth :—

*Nátolâ dutchâmâiâ amebo binpa.*  
Taking stealing lie he tells.

*Senyo fi dingdung dingtobo.*  
Tiger tooth oath I will swear.

*Ngo amebo binbanung (or dutchâbanung) gamto.*  
I false say if (steal if) bite.

*Ngo amebo binmâbanung (or dutchâmâbanung) gamio.*  
I false say not if (steal not if) bite not.

To charm away any evil results of a false oath the swearer digs a little hole 1' 6" deep near the ladder of his house. An egg is broken and thrown into the hole, together with the carcase and head of a decapitated fowl. The hole is then filled in and a small stone placed on the mound of earth. The ceremony is accomplished by the repetition of these words while the right foot is placed on the mound.

*Sülogalako dingdungno gamkhumâbo.*  
To-day from oath will not bite.

This oath is varied in many different ways. Instead of the tiger's tooth the oath may be taken on a 'dao', arrow, spear, earth from a grave, or on several climbers which die back every year. They are as unreliable as the oath on the tiger's tooth because the false swearer may save himself from retribution by means of the simple ceremony described above.

#### SODUNG DINGDUNG.

Perhaps the most interesting of all the Dafla oaths is the *Sodung Dingdung* or ordeal by boiling water. I had long wished to see this oath taken but only recently have I had an opportunity of doing so. As the taking of this oath has never before been witnessed by a European I have described it in some detail.

The circumstances which led up to the ordeal were as follows :—

A young girl died suddenly in the house of Harre Moya, a headman in the Dafla settlement. The immediate cause of death was a ruptured spleen which might have been caused by a blow over the organ or a heavy fall. There were no marks of violence on the body but there were rumours of a quarrel and one man came forward and alleged that Harre had knocked the girl down and kicked her.

I took the case up in court and had to acquit Harre of a charge u/s 325 I.P.C. on account of the overwhelming evidence brought forward by him that the girl had had a fall on the 'machang' of his house. The prosecution witness was one Rayom Burra who is the most complete blackguard in the Dafla settlement, which is saying a good deal, as anyone who is acquainted with Daflas will testify. This, coupled with the fact that Harre himself and all his family took an oath on the tiger's tooth that he was innocent, swayed me in his favour.

A slight digression must be made here into Dafla eschatology. After death the *yalo* or soul of a man is transformed into a ghost which haunts the earth for some time after burial and has power to attack living persons. Should the death be a natural one, the ghost is called *Sunu urem* and goes to a special abode of the dead called *Chengsi*, whence it returns and haunts the locality in which its earthly body lived. This ghost appears in the form of a living person and those who see it are liable to pains in the liver. A *nyebu* can easily free the sufferer from the attentions of this ghost.

When the death has been a violent one, 'apotia' as it is called by the Assamese, the ghost is called *Senyo urem* and its abode is named *Chengru*. This ghost appears in the form of a tiger and should the death be due to murder, haunts the house of its murderer. Such a ghost is with great difficulty cast out and unless a *nyebu* is at hand the sufferer invariably dies.

Shortly after I had acquitted Harre of the criminal charge I heard that a *Senyo urem* had made its appearance in Harre's village and that he had performed the prescribed ceremony to get rid of this ghost. The two parties then appeared before me and Harre again denied that he knocked the girl down, while Rayom just as vehemently alleged that he did knock her down and kick her. I suggested that it would be a very satisfactory ending to the case if it were settled by the *Sodung dingdung*. Both agreed on the spur of the moment and I held them to this promise.

Having decided upon the oath a great deal of talking had to be got through before a *nyebu* to perform the ceremony could be selected. Harre gave a good deal of trouble in this

respect and made most absurd demands. First of all he wanted seven medicine men, chiefly, I believe, because he knew that that number was not available. Then he wanted a *nyebu* for himself and one for Rayom. This also was impossible because no *nyebu* with a pregnant wife will perform this ceremony, and of the three *nyebus* at Lokra, two had wives in this fruitful condition. After a good deal of shouting and talk it was agreed that one Tachung Sengdâ should perform the ceremony. Tachung Sengdâ then demanded a guarantee that he be absolved from all blame should either of the contestants come to any harm. Strange though it may seem this is a very sound condition. Recently a man, whose father had taken a false oath and died as a result of it, brought a case for damages against the *nyebu* who administered the oath. When all had been satisfactorily settled a day was fixed for the ordeal.

A period of preparation is necessary before the oath is actually taken and 24 hours before the parties, accompanied by the *nyebu*, go into the jungle, where they must not eat any warm food, a fire may not lit, and no man, woman or child may approach them. It is very difficult to get at the reasons for the period spent apart but the underlying motives seem to be (1) to allow the presiding spirits to examine the conscience of each man in the quiet of the jungle, and (2) to ensure that no harm may befall the villagers from the concourse of spirits called up by the *nyebu*.

Before the parties undergo the ordeal the *nyebu* is careful to wash and cut the nails of the left hand of each, because it is believed that were a small piece of lime to be inserted under a nail the trial will not work. For the same reason also, when they are about to undergo the ordeal, a careful watch is kept to see that they do not spit on the palm of the left hand.

On the morning of the appointed day a crowd of villagers assembled and cleared an open space in the jungle in the centre of which was built a small circular enclosure. All the villagers came to see the fun except those men whose wives were pregnant. Should they come their wives are liable to miscarry.

The enclosure had two openings, each just large enough for one man, one towards the north, where the *nyebu* takes his stand on a small ramp of four stakes, the upper end being 1' above the ground, and one towards the south for the contestants. No special wood is used for the ramp.

The enclosure was built of thin wooden uprights and horizontals bound with cane, forming a lattice the openings of which are about 1 foot square. All around the stockade were 'panjis' 3' long pointing outwards. No special wood was used. Inside a large fire was kindled and fanned to white heat with winnowing trays. In the centre of the fire was a 'chunga' cut from the large bamboo *Bambusa kakua*. The 'chunga' was inclined at an angle of 45° and faced south where the other

opening was situated, and it is through this opening that the contestants enter to plunge their arms into the boiling water.

At the southern opening an elaborate flooring of logs was laid down. From south to north the series is:—

1. A log of ordinary wood.
2. A log of the tree *Ficus rhododendrifolia*.
3. Several lengths of the creeper *Entada scandens*. The opening in the stockade.
4. A series of pieces of ordinary wood.
5. A log of *Ficus rhododendrifolia*.

The 'chunga' was filled with water which must be brought from a large river, e.g. the Bhorelli, *Kamin* to the Daflas, which was close at hand. Into it were cast a tiger's tooth, a small stone, leaves of the stinging nettle *Laportea crenulata*, and the bark of the trees *Ficus rhododendrifolia* and *Tetrameles nudiflora*.

*Laportea crenulata* is the worst stinging nettle known, the bark of *Ficus rhododendrifolia* causes itching, while the tree *Tetrameles nudiflora*, which grows to an enormous size, is supposed to be the abode of a malignant spirit.

When all was ready the *nyebu* stood on the ramp and swung a leafy branch backwards and forwards over the fire with his right hand and constantly muttered the following incantation:—

*Amebanung, mingbanung, gamto.*

Lie if, killed if, bite.

*Amemâbanung, mingmâbanung, gamio.*

Lie not if, killed not if, do not bite.

When the water began to boil in the 'chunga' Harre appeared with his hair let down, his 'dao' over his right shoulder and naked save for his 'lengta'. He stepped into the southern opening, a yard from where I was watching, and thrust out his left hand towards the 'chunga'. At that moment the water boiled furiously and some splashed over the back of his hand whereupon he at once drew back and left the enclosure. He was immediately followed by Rayom who shouted as he entered the southern opening:—

*Amebo binkhumâ, gamio.*

Lie said not, do not bite.

and thrust his arm up the elbow into the boiling water for 1 or 2 seconds and then withdrew it. I immediately examined both of them and found that Harre's hand was burning hot while that of Rayom was as cool as a snake.

All the Daflas round about accused Harre of not putting his hand into the 'chunga' and all said that he was guilty. Harre clearly was overcome and he sank down to the ground, where he

was surrounded by his friends. He refused to face the boiling water a second time.

Rayom, who was the big man of the day, did not allow his experience to worry him, but went round to the northern opening where the *nyebu* still stood on his ramp waving his branch over the fire, repeating his incantation. A small fowl was brought, its head cut off and the carcass thrown upon the fire. Rayom then facing inwards shouted these words:—

*Sodung dingdung nyebue gampana.*  
the sorcerer bit.

*Ume garpanna, Rayome iderrpakhu.*  
Fire made Rayom was saved.

*Hâgabo porrok mingkhuna,*  
This for fowl killed,

*Ume verrulektokhulâ, hâgabo ume mikpakhuna,*  
Fire scattered, this for fire put out,

*Hâgabo odungem papenna.*  
For this 'chungâ' cut.

*Nolaga Bengniga rechenga.*  
We Daflas do this.

(The *nyebu* prepared the *Sodung Dingdung* and made a fire. Rayom came through unscathed. According to Dafla custom I have killed a fowl, scattered and put out the fire and smashed the 'chungâ'.)

After which he sprang into the stockade, scattered the fire, and smashed up the 'chungâ' with his 'dao'. After this all the Daflas present gave vent to a series of long drawn out 'ho's' alternating with humming through the nose.

During the afternoon Harre was very ill and vomited and apparently was in great pain. Rayom, however, was quite fit but complained of itching on the back of his hand and arm.

I examined both of them next day and found Harre with several large blisters on his fingers. The skin on the back of Rayom's arm was thickened and rough but there was no local pyrexia or any sign of scalding, though he complained of intolerable itching. The palm of his hand and fingers showed no injury whatever.

The party who is adjudged guilty by the trial is put to considerable expense. The *nyebu* gets from him one yoke of oxen, one large silk cloth, one 'dao', one spear, and one arrow. In addition he must slaughter one yoke of oxen and one pig and give the flesh as a feast to all the villagers.

This oath is very rarely taken owing to the great expense.

## RÂKDERR DINGDUNG.

(Iron oath.)

The procedure in taking this oath is exactly the same as that for the *Sodung Dingdung*, with the exception that instead of a 'chunga' of boiling water a piece of iron is placed in the fire. The fire is fanned as usual with winnowing trays until the iron is red hot. The man about to swear comes forward, places a leaf of *Ficus rhododendrifolia* on the palm of his hand and on the top of that a leaf of *Laportea crenulata*.

The *nyebu* says :—

*Aè dutchâbanung râkderrno gamto.*

He steal if iron bite.

*Aè dutchamâbanung gamio.*

He steal not if bite not.

A bystander by means of a pair of pincers lifts the red-hot iron from the fire and places it on the hand of the swearer. He takes no harm if guiltless, but should he be guilty it burns clean through his hand. When the iron is placed on his hand he says :—

*Ngo dutchâbanung gamto.*

I steal if bite.

*Ngo dutchamâbanung*

I steal not if

*Enniamâbanung gamio.*

Guilty not if bite not.

I have not seen this ordeal but my informant, the *nyebu* Karu, tells me he saw it done once and in this case the man was not guilty and was able to hold the iron on his hand and took no harm therefrom.

## SORI DINGDUNG.

This is one of the more important Dafla oaths and it is alleged that death invariably follows the taking of a false oath. I know of two cases in which almost certainly a false oath was taken. In the first case the man himself died from what disease I could not ascertain; in the second the swearer, his wife and family all died within a short time from malaria or some fever of like nature.

There are no preliminaries as in the *Sodung Dingdung* and *Râkderr* oaths and both parties meet in the presence of the *nyebu* under a large tree. A branch of *Laportea crenulata* is stuck in the ground and beside it is placed a Y shaped post of the same species, about 3" in diameter, the arms of the fork being 1' 6" long.



The following articles are brought by the *nyebu* and piled up under the tree :—

1. *Mamupodurungte* (Branches of *Laportea crenulata*).
2. *Sengrit* (Branches of *Ficus rhododendrifolia*).
3. *Senyo fi* (Tiger's tooth).
4. *Chégé* (Dao).
5. *Nengko* (Spear).
6. *Yamdök* (Chilli).
7. *Hati'é* (Elephant's dung).
8. *Burru supin* (Skin of the *Burru*).
9. *Máklung* (Core of a thunderbolt).
10. *Öpök* (Arrow).
11. *Ráktik* (Arrowhead).
12. *Upno* (Aconite).
13. *Kamin ishi* (Water from the Bharelli).
14. *Eleng* (Stone).
15. *Hápök* (Chicken's liver).

A pig, which is provided by the party who is making the other party take the oath is tied to the sacrificial post with its head between the arms of the fork. A small hole is dug in the earth just below the neck of the pig. When all is ready the *nyebu* calls up the spirits as follows :—

*Secheng dingdung Sori,*  
Grave oath Sori,

*Borru dingdung Sori,*  
Water snake oath Sori,

*Hai dingdung Sori,*  
Water oath Sori,

*Dányi dingdung Sori,*  
Sun oath Sori,

*Seu dingdung Sori,*  
Jungle spirit oath Sori,

*Oro' dingdung Sori,*  
Small knife oath Sori,

*Upno dingdung Sori,*  
Aconite oath Sori,

*Podu modu dingdung Sori,*  
*Laportea* oath Sori,

*Ume, Setum, Sera, Hati, Senyo,*  
Fire, bear, wild pig, elephant, tiger,

*ungto.*  
come.

The meaning of the word *Sori* has been lost and is not known to the Daflas themselves.

The head of the pig is now severed from the body with one blow of a 'dao' and the blood allowed to collect in the hole. The chest cavity is opened and the heart torn out and skewered upon a sliver of the bamboo *Bambusa tulda*. The *nyebu* offers this tit-bit to the man about to swear with these words.

*No dutchanénung gamrem.*

You steal not if will not bite.

*No dutchábanung gamtare.*

You steal if will bite.

The man takes the heart and eats it; after which he puts his index finger into the blood and conveys some to his lips.

He then says—

*Ngo metobanung, medonung doto,*

I lie if, lie if eat,

*Hâ dingdungno, Senyono, Setumno,*

This oath by tiger bear

*Hatino, Dányino, Burruno. Haino*

Elephant, sun. water snake. water spirit

*Seuno doto.*

Jungle spirit eat (me).

*Memâbanung ngum dányi*

Lie not if me sun

*Senyempila sübo soto.*

Unharmed alive like this keep.

This terminates the proceedings.





### Ekānamśā and Subhadrā.

By JOGENDRA CHANDRA GHOSH.

Monier Williams gives two meanings of the word Ekānamśā:—1. *Kuhū* or the New Moon, 2. A name of Durgā. As an illustration of the first meaning, the following text is referred to:—

“महामखेष्वाङ्गिरसौ दीप्तिमत्सु महामते ।

महामतीति विख्याता सप्तमी कथ्यते सुता ॥ ७ ॥

यान्तु दृष्ट्वा भगवतीं जनः कुङ्कुहायते ।

एकानंशेति तामाहुः कुङ्कुमङ्गिरसः सुताम्” ॥ ८ ॥

(महाभारत, वनपर्व, २१७ अध्याय ।)

From the above, we gather that the seventh daughter of Āngirā was known as Mahāmātī in the sacrifices. She was called Kuhū, because people seeing her used to imitate the sound of *Kuhu*, *Kuhu*. This Kuhū was also called Ekānamśā. We do not understand how from this Ekānamśā can be interpreted as ‘new moon’. People used to imitate the sound, ‘*Kuhu*, *Kuhu*’, probably because she was of dark complexion like *Kuhu*, i.e. the Indian Cuckoo, or the new moon.

The earliest mention, in the second sense, as far as we know, is found in the *Harivaṃśa*, in connection with the birth of Viṣṇu as Kṛṣṇa. It is said therein that when the gods approached Viṣṇu to relieve the earth from the demon Kāṃsa and his followers, the god promised to be born in the womb of Daivakī, wife of Vasudeva. He bade the goddess Nidrā (the Māyā of Viṣṇu) to take her birth as the daughter of Yaśodā, wife of Nanda Gopa. He also told her that when Kāṃsa, with a view to kill her, will throw her on a stone, she would escape to the sky and assume four arms, holding trident, sword, wine cup and lotus in them. People will recite the *Āryāstava* in her praise etc. etc. (Ch. 58).

Things happened as told by Viṣṇu and the goddess came to be worshipped, for the protection of Keśava (Kṛṣṇa), and identified with Yoga-kanyā Ekānamśā, born from the *aṃśa* (part) of Prajāpati (Brahmā).<sup>1</sup>

<sup>1</sup> सा कन्या वदधे तत्र दृष्टिसद्वनि पूजिता ।

पुत्रवत् पाल्यमाना सा देवदेवाज्ञया तदा ॥

The only mention of Ekānamśā in iconographical literature is found in the *Brhat-samhitā*. Therein Varāhamihira gives the following directions for the construction of her image :—

एकानंशा कार्या देवी बलदेवकृष्णयोर्मध्ये ।

कटिसंस्थितवामकरा सरोजमितरेण चोद्धतौ ॥ ३७ ॥

कार्या चतुर्भुजा या वामकराभ्यां सपुस्तकं कमलम् ।

दाभ्यां दक्षिणपार्श्वे वग्मर्थिव्यक्षस्तृचं च ॥ ३८ ॥

वामेव्यष्टभुजायाः कमण्डलुश्चापमम्बुजं शास्त्रम् ।

वरशरदर्पणयुक्ताः सद्यभुजाः साक्षस्तृत्राश्च ॥ ३९ ॥

उद्धर्तृहिता, ५८ अध्याय ।

Here three varieties have been described, viz., two-armed, four-armed and eight-armed. She was, perhaps, born two-armed. She assumed four arms according to the *Harivamśa*, as we have seen above. In the *Viṣṇu-* and the *Brahma-purāṇas* she has been described as eight-armed. In these two *Purāṇas* she is not named as Ekānamśā, but as 'Yoganidrā', 'Mahāmāyā' and 'Vaiṣṇavī' (i.e. the *Śakti* of Viṣṇu). Here in the *Bṛhat-samhitā* we find a new element, i.e. her association with Valadeva and Kṛṣṇa, of which there is no explicit mention in the *Harivamśa*, although some indications have been given in Ch. 160. We shall try to see presently how it came about.

Varāhamihira in his short chapter on *Pratimā-lakṣaṇa*, consisting of 58 *ślokas* only, devotes three verses to the description of Ekānamśā. This shows that in his time, i.e. in the sixth century A.D., she must have been an important and popular deity. As such, we can fairly expect that some icon or sculpture representing her must be found somewhere. We are not disappointed in this. We have been fortunate in tracing one such in the Lucknow Museum.<sup>1</sup> Who knows that there are not many others lying elsewhere unidentified or wrongly identified?

विद्धि चैनामद्योत्यन्नामंशादेवीं प्रजापतेः ।

एकानंशां योगकन्यां रक्षां केशवस्य च ॥

तां वै सर्व्वं सुमनसः पूजयन्ति स्म यादवाः ।

देवौश्च दिव्यवपुषं कृष्णः संरक्षितो यया ॥

हरिवंश, ६० अध्याय ।

<sup>1</sup> I am indebted to Mr. K. N. Diksīt, Superintendent, Indian Museum, Calcutta (Now Deputy Director of Archaeology, Delhi) for the information about this piece of sculpture, and to Rai Bahadur Prayag Dayal for sending us a copy of reprint of his paper.

The sculpture was found by Mr. N. C. Metah, I.C.S., in the district

Rai Bahadur Prayag Dayal, Curator, Provincial Museum, Lucknow, has published an account of the '*Important sculptures added to the Provincial Museum, Lucknow, during the last decade*', with plates, in the pages of the *Journal of the U.P. Historical Society*, Vol. VIII, part II, 1934. He gives the following particulars of the plate 5 :—

"This slab (3'4"×2'3") carved in deep relief depicts a group of three figures which may tentatively be described as Lakṣmaṇa, Sītā, and Rāma. Lakṣmaṇa has a seven-hooded canopy significant of his *śeṣavatāra* and is four-armed, like his brother Rāma on the corresponding end, holding the usual attributes of Viṣṇu. The central figure may be Sītā or Lakṣmī wife of Viṣṇu, standing like Rāma, with a nimbus of lotus design on a lotus seat and holding a lotus stalk in her left hand. The open palm of her right hand bears a lotus mark and is let down in *Varadamudrā* or boon-giving posture. According to general practice she should have been placed to the left of Rāma, but probably for the sake of symmetry the artist has put her to the right of Rāma in defiance of the law of custom."

We are not satisfied with Rai Bahadur's tentative identifications. His Lakṣmaṇa is, no doubt, Valadeva, as the seven-headed serpent canopy clearly indicates. The other male figure, in the left is his younger brother Kṛṣṇa. The female figure, in the middle is no other than Ekānaṁsādevī. Her position, as well as the two aerial beings (*Vidyādhara*s), on two sides of her lotus *nimbus*, mark her out to be the principal deity. Valadeva and Kṛṣṇa here, by position, are, no doubt, her *pārśadas*, i.e. companion deities.

From the description of the Rai Bahadur, and from the plate, it appears that she is two-armed. But the pose of her hands and the position of the lotus are not exactly as described by Varāhamihira, in the case of the two-armed image. They, however, tally with the descriptions of the two of the arms of the four-armed deity. This slight inaccuracy is immaterial. It may be due to the artist's following some other canon than that of the *Bṛhat-saṁhitā*.

A living instance of the worship of this triad will be found at Puri, in the temple of Jagannātha. The central figure there is not Ekānaṁsā, but Subhadrā. We are not aware of anything about the deification of Subhadrā, like her brothers. It is not, however, very difficult to prove that she is no other than our Ekānaṁsā, a manifestation of Durgā or Kātyāyanī. The *Brahma-purāṇa*, which names the central figure as Subhadrā, cites the following as her *namaskāra-mantra* :—

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of Etah, while he was Magistrate there. He also published an account of it in the *Calcutta Modern Review* of July, 1923, pp. 43-45.

नमस्ते सर्वगे देवि नमस्ते शुभसौख्यदे ।

चाहि मां पद्मपत्राक्षि कात्यायनि नमोस्तु ते ॥ ५८ ॥

ब्रह्मपुराण, ५७ अध्याय ।

There is no mention of Subhadrā in it. The second नमस्ते is redundant here. The first line probably stood originally as नमस्ते सर्वगे देविकानंशे शुभसौख्यदे । She has been addressed as Kātyāyāni, which is a name of Durgā. Again सर्वगा i.e. one who goes everywhere, cannot be applied to Subhadrā. The epithet, however, well applies to Ekānamśā, who has been called त्रैलोक्यचारिणी and सर्वगा (H.V., Ch. 58 and *Matsya Purāṇa*, Ch. 154). We shall be presently seeing how Subhadrā came to take the place of Ekānamśā.

In this connection, there arise three very interesting points. They are—(1) How and when Durgā came to be called Ekānamśā. ? (2) How she came to be associated and worshipped along with Valadeva and Kṛṣṇa ? and (3) How and when her name came to be changed to Subhadrā ? We shall try to solve these questions to the best of our ability.

Let us see if the etymology of the word Ekānamśā can help us in this direction. The word is composed of two words, in *Samāsa*, namely, *eka* and *anamśa*, with the suffix *ā* in the feminine. *Eka*, among others, means 'one', 'chief', 'pre-eminent'. *Anamśa* means 'not part'. So Ekānamśādevī means the goddess, who is one and is not part of any other. Thus she is *अद्वैत* and *अखण्ड*,<sup>1</sup> which amounts to *आद्याशक्ति* (Primal Energy) of the Śāktas.

It appears to us that Ekānamśā was being worshipped by the Yādavas as their tribal guardian deity.<sup>2</sup> There is nothing to be wondered at this. In the *Bhāgavata* we find the *gopinīs* performing the Kātyāyāni-Vrata. The worship of *Śakti* prevailed there before the rise of the Kṛṣṇa cult. When they found that the daughter of Yaśodā was the means of saving directly the life of Kṛṣṇa, and indirectly that of Valadeva, their favourites, they thought that she is no other than their household goddess Ekānamśā. Valarāma and Kṛṣṇa, most probably, came to be associated with the goddess as her wards, or as two notable representatives of her votaries. When the Kṛṣṇa cult rose into prominence, the popular worship was not rejected altogether, but appropriated and given a subordinate position. Thus she came to be worshipped along with her two deified wards.

<sup>1</sup> एका आनंशेति एकानंशा भगवता एका सतो अविभक्ता । नीलकण्ठ ।

<sup>2</sup> In the *Harivamśa*, Chs. 166, 168 and 178, we find that the Yādavas invoked her aid in times of difficulty.

According to the *Brahma-purāṇa*, King Indradyumna of Avanti built the temple at Puri and introduced the worship of Kṛṣṇa, Valarāma and Subhadrā. He worshipped Puruṣottama Viṣṇu according to the Pañchrātra rituals<sup>1</sup> (Ch. 48, V. 12). To retain Ekānāmśā among the triad means to give a *Śākta* deity preference over their gods. Besides she required to be worshipped according to the *Śākta* rituals with meat and wine. Viṣṇu said :—

चरिष्यसि महाभागे वरदा कामरूपिणी ।

कृतानुयात्रां भूतैस्त्वं सुरामांसबलिप्रिया ।

तिथौ नवम्यां पूजा त्वं प्राप्स्यसे सपशुक्रियां ।

हरिवंश, ५८ अध्याय ।

Both these were, no doubt, repugnant to the followers of the Pañchrātra system. So they had recourse to the expediency of changing Ekānāmśā to inoffensive Subhadrā. This required only the change in name. This was helped by the fact that Ekānāmśā having been born as the daughter of Yaśodā, the foster-mother of Kṛṣṇa, she was a sister to him.<sup>2</sup> Subhadrā also held the same relationship.<sup>3</sup> Further an indication of this

<sup>1</sup> According to the *Skanda-purāṇa*, Viṣṇu-Khaṇḍa, Puruṣottama-māhātmya Ch. 29. Valabhadra is to be worshipped by the *dvādaśākṣara-mantra* ; Puruṣottama, by *puruṣa-sūkta* ; and Subhadrā according to the *Devī-Sūkta*.

<sup>2</sup> She has been called विष्णुभगिनी, भगिनीरामकृष्णयोः (*Harivamśa*, Chs. 178 and 160), and also called यादवी (*Trikaṇḍaśeṣa*).

<sup>3</sup> The *Skanda-purāṇa* must have noticed the anomalous position of Subhadrā, and has come forward with an explanation that she is none other than लक्ष्मी (लक्ष्मीं लक्ष्मीश-हृदय-पङ्कजस्यां पृथक्स्थिताम् ॥ ६२ ॥ विष्णुषष्ठ, पुरुषोत्तममाहात्म्य, ५ अध्याय) Again it says :—

सुभद्रा चारुवदना वराजाभयधारिणी ॥ १० ॥

लक्ष्मीः प्रादुर्बभूवेयं सर्वचैतन्यरूपिणी ।

इयं कृष्णावतारे हि रोहिणीगर्भसम्भवा ॥ ११ ॥

बलभद्राकृतिर्जाता बलरूपस्य चिन्तनात् ।

क्षणं न सङ्गते सा हि मोक्तुं नीलावतारिणम् ॥ १२ ॥

न भेदस्त्वसि को विप्राः कृष्णस्य च बलस्य च ।

एकगर्भप्रसूतत्वाद्वावहाराऽथ लौकिकः ॥ १३ ॥

भगिनी बलदेवस्य ह्येषा पौराणिकी कथा ।

पुरुषेण स्त्रीरूपेण लक्ष्मीः सर्वत्र तिष्ठति ॥ १४ ॥

पुंनाम्ना भगवान् विष्णुः स्त्रीनाम्ना कमलालया ।



is also found in the *Harivaṃśa*, where in the *Āgryāstava*, Ekānamśā or Nidrā has been addressed as the daughter of Nanda Gopa and also as the sister of Valadeva, as—

भगिनी बलदेवस्य रजनी कलहप्रिया ।

आवासः सर्वभूतानां निष्ठा च परमागतिः ।

नन्दगोपसुता चैव देवी त्वमपराजिता ।

हरिवंश, ५६ अध्याय ।

This nominal change not only served their dual purposes excellently, but also saved them a change in the images, which surely would have offended the popular belief. By this change Ekānamśā has lost her position as the principal deity. She now occupies the third position among the triad.

Some scholars have seen in the images of the Jagannātha temple, the Buddhistic *Triratna*, viz. Buddha, Dharma and Saṅgha. But we do not see what plausible explanation there can be to represent Dharma as a female deity. If our identification is correct, the worship at Puri represents the superimposition of Vaiṣṇavism over Śāktism, and not Brahmanism over Buddhism.

देवतिर्यङ्मनुष्यादौ विद्यते नैतयोः परम् ॥ १५ ॥

को ह्यन्यः पुण्डरीकाक्षद्वयानि चतुर्दश ।

धारयेत्तु फण्येण सौजन्यो बलमञ्जितः ॥ १६ ॥

तस्य शक्तिस्वरूपेयं भगिनी-स्त्री-प्रवर्तिका ।

(*Ibid.*, Ch. 19.)

This explanation is not at all tenable, in view of the *namā-kāra-mantra* quoted above. Further in the *कृष्णावतार*, Rukmiṇī is the incarnation of लक्ष्मी, and not सुभद्रा as कृष्ण says:—

रुक्मिणी नाम ते कन्या न मा प्राकृतमानुषी ।

त्रैरेषा ब्रह्मवाक्येन जाता केनापि जेतुना ॥

हरिवंश, १०९ अध्याय ।



KRṢṢA

EKĀNAMAŚA

VALADEVA



## **The Phonetics of Lahnda.**

By SIDDHESHWAR VARMA.

### INTRODUCTION.

The area of the language, spoken in the west and the extreme north of the Panjab, has been minutely defined by Sir George Grierson<sup>1</sup> and he calls it 'Lahnda or Western Panjabi'. Neither of these terms, however, seems to be appropriate. As regards 'Lahnda', it may be doubted if the vast majority of the speakers of the language would understand the term if it refers to their mother-tongue, whether we call it 'Lahnda' or 'Lahndi'. But what really makes the term inappropriate is the fact that 'Lahnda' is only a relative term, signifying a *direction* from the standpoint of Panjabi speakers. If the language in question be called Lahnda, from the Panjabi speakers' standpoint, Panjabi may be called [cârda] from the Lahnda speakers' standpoint. While the names for all the other languages in India positively refer to a nationality or to a definite geographical area, the choice of a mere direction for a language spoken by more than 5 million inhabitants<sup>2</sup> of India is rather unhappy. We speakers of this language call it [vatni boli]. But the name [vatni] would go to the other extreme: it would suggest as if there existed only a single language that claimed to be called 'national' in the absolute sense.

The term Western Panjabi seems to be more significant, for it refers to a positive geographical area; but it is also open to several objections. In the first place, ours is a language distinct from Panjabi, as will be shown in the following pages, and as Grierson himself admits.<sup>3</sup> Moreover, Grierson devotes a separate volume to what he calls 'Panjabi'.<sup>4</sup> Two separate volumes, one relating to 'Panjabi', and the other to 'Western Panjabi' give us overlapping terms. If the former is intended to imply 'Panjabi proper', the implication may suggest that 'Western Panjabi' was only an appendage to, or a mere dialect of, 'Panjabi proper'. 'Western Panjabi', properly speaking, is that branch of Panjabi which is spoken in certain areas between the Ravi and the Jhelum, represented, among others, by the towns of Gujrat, Wazirabad, Sialkot and Gujranwala; while 'Eastern Panjabi'

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<sup>1</sup> *LSI*, VIII, p. 233.

<sup>2</sup> According to the *Census of India*, 1921, (p. 91) the number of Lahnda speakers in India in 1921 was 5,652,264.

<sup>3</sup> *LSI*, VIII, p. 233.

<sup>4</sup> *LSI*, Vol. IX.

is the one spoken in certain areas of Eastern Punjab, represented by dialects like Ludhianvi<sup>1</sup> dealt with by Dr. B. D. Jain in his treatise on the Phonology of Panjabi.

I should therefore suggest the term 'Sindh-Sāgrī' instead of Lahnda or Western Panjabi. This term has many advantages. Firstly, it refers to a positive area, and not a mere direction, as 'Lahnda' suggests. Secondly, the name 'Sindh Sāgar' has a historical significance, for it was used by Akbar's Government to include not only the present 'Sindh Sāgar Doāb', but several other allied tracts, possibly Jhang and parts of Multan also.<sup>2</sup> Thirdly, the Sindh Sāgar Doāb is *par excellence* the 'Lahnda'-speaking area. The name 'Sindh-Sāgrī' would include all the northern dialects of 'Lahnda', except a small tract about thirty miles east of the Jhelum, where the language may be said to have emigrated. And it would also include most of the dialects spoken in the area south of the Salt Range. But here three objections may be raised: (1) The designation proposed would exclude trans-Indus dialects. But this objection has no validity, as the speakers of these dialects are evidently the descendants of emigrants from cis-Indus areas. (2) It would exclude the dialect spoken in Multan, as that city is not situated in the Sindh Sāgar Doāb. But as the dialect of Multan is practically identical with that spoken in the regions south of the west Salt Range, even this may be taken as an offshoot or emigration from the Sindh Sāgar Doāb. According to the *Punjab Gazetteer* 'the dialects spoken in the Dehra Ghazi Khan, Multan and Muzaffargarh Districts are homogeneous, resembling the dialects spoken in the *Sindh Sāgar Doāb*'.<sup>3</sup> The popular name for the former dialects is 'Multani', presumably owing to the commercial importance of Multan, but from the historical point of view it seems to be more probable that the dialects mainly belonged to the Sindh Sāgar area, and that they spread both ways, eastward to Multan, which approaches the frontier of 'Lahnda', and westward to the trans-Indus side. (3) But a more serious objection may be raised, viz. that the proposed title would exclude what Grierson<sup>4</sup> takes as the 'Standard' Lahnda, viz. the one spoken in the 'Shahpur, Jhang, Lyallpur, Montgomery,

<sup>1</sup> My friend Dr. B. D. Jain, to whom I showed some of my Lahnda transcriptions, suggests that no speaker of eastern Panjabi, except a Panjabi scholar, would understand even a sentence of my mother-tongue.

<sup>2</sup> Cf. R. G. Thomson, *Jhelum Settlement Report for 1874-80*, p. 24: 'Under Akbar the whole district (Jhelum) was included in the Sindh Sāgar Sarkār, which seems to have been generally equivalent to the present districts of Rawalpindi, Jhelum and Shahpur. It is impossible, however, to identify many of the 42 Mahals into which it was divided'.

<sup>3</sup> *Punjab Gazetteer*: Bahawalpur State, 1904, p. 115, cf. Grierson, *LSI*, Vol. VIII, p. 381: 'The same form of speech is spoken across the Indus, in Dehra Ismail Khan and Bannu... Wherever it is spoken it is practically the same dialect, and closely agrees with Multani'.

<sup>4</sup> *Op. cit.*, p. 239.

Gujranwala and Gujrat districts'. But of these, Shahpur and Jhang are not far from the river Jhelum, and may be practically taken as belonging to the Sindh Sāgar area ; while the dialects spoken in most of the other districts mentioned gradually shade off into Panjabi. It seems to be rather unfortunate that the dialects spoken in these areas were taken as the Standard : for linguistically the so-called 'Standard' is nearer to Panjabi than the other two branches of 'Lahnda' are, as the following examples will show :—

- (a) The dative of most of the northern dialects of 'Lahnda' is formed by the post-positions [ā], [ki], or [ā̃] (as ['rame ā, 'rame ki] (Poṭhwāri), 'to Rāma'); [mā̃] ('to me'). But the dative of the 'Standard' is formed by the post-position [nū] peculiar to Panjabi.
- (b) The genitive singular termination of personal pronouns in northern and southern dialects is [dā] (except [ra] in certain hilly tracts of Poṭhwāri), e.g. ['mēdā] or ['mēdā], but the 'Standard', has [ra] as it is in Panjabi, viz. ['mera, 'tera].
- (c) The oblique singular of both the northern and southern dialects has the termination *e* as in [ghare], but in the 'Standard', as in Panjabi, it is without *e*, e.g. [ghar].
- (d) The genitive 2nd pers. plural of both the Northern and Southern dialects has the stem [tus], cf. [tu'sdā] or [tu'siddā], but in the 'Standard' it is [tuh] as in Panjabi, cf. [tu'hdā].
- (e) Some of the ordinal numbers are also different, e.g. while the Northern has [duc] and the Southern [beja], the 'Standard' has [duja] as in Panjabi.
- (f) The Co-relative Pronoun 3rd pers. singular oblique in the Northern and the Southern is [us], but in the 'Standard' it is [os], as it is in Panjabi.<sup>1</sup>

Nor can the number of speakers claim for the dialect in question the designation of the 'Standard'. For according to Grierson the number <sup>2</sup> of the speakers of the Northern dialects alone is about a million more than his 'Standard'. The title 'Sindh-Sāgrī', therefore, would not suffer even if Grierson's 'Standard' be excluded from it. But, properly speaking, the 'Standard' is an offshoot of Sindh-Sāgrī. Finally, the appropriateness of the title 'Sindh-Sāgrī' is further confirmed by its close affinity to the sister-language Sindhi.

Considering the fact, however, that a name once given, like any convention, tends to be maintained, we may acquiesce in

<sup>1</sup> *Op. cit.*, pp. 239, 243, 298, 300.

<sup>2</sup> *Op. cit.*, p. 243 : 1,752,755 against 881,425 in the 'Standard'.

the acceptance of the conventional name 'Lahnda', though Lahnda, as Bailey<sup>1</sup> has rightly pointed out, does not sound well either to English or Indian ears. But as regards the main divisions of the language, we shall use the word 'Central' instead of the 'Standard' for the dialect in question—'Central' in the *geographical*, and not in linguistic sense. Accordingly, we shall divide Lahnda into three main branches: (1) Northern, comprising the dialects spoken in the north of the Salt Range, (2) Central, corresponding to Grierson's 'Standard', (3) Southern, corresponding to the so-called 'Multani', the characteristic features of which, especially cerebralization, have a closer affinity to Sindhi. The designation 'Southern' will include the dialects spoken in the west beyond the Indus, for, as stated above, even in these tracts it is practically the same dialect that is spoken.

#### LITERATURE.

Lahnda has hardly any literature of importance. In this sense it is a dialect *par excellence*. By the people of the central and eastern Punjab Lahnda is actually considered to be an inferior dialect—a language of rustics [*ṛāṭki bolī*], so that Lahnda speakers, when they come to those areas, feel shy of speaking their mother-tongue, and there has been therefore little impetus to any literary work in this language.

A few literary works, however, may be mentioned: (1) The *Janam Sākhī* of Guru Nānak, described in detail in Appendix A; (2) the *Asrār-i-Farīdī* of Ghulām Farīd, see Appendix B; (3) the *Sī-harfī* of Muhammed Azam; (4) the *Kāfīs* of Sayyad Mīran Shāh; (5) the *Saifal* of Saifal Shāh. The last three works are in the Bahawalpuri sub-dialect of Southern L.<sup>2</sup>

#### *The Kahūṇī (Kə'huṇī) Sub-dialect.*

The sub-dialect primarily considered in this treatise is what we shall call Kə'huṇī, the present writer's mother-tongue. The Kə'huṇī<sup>3</sup> is a basin of the Salt Range upland. To quote Thomson<sup>4</sup>: 'The Salt Range upland is split up into 3 main basins by the looped structure of the hills.... From west to east these are named Vunhār, Kahūn and Jhangar. Each of these is crossed by small subsidiary ridges which divide it still further'. Now the dialect spoken in Kə'huṇī is not the one described by Wilson as the 'Salt Range dialect'—a fact which has been noticed by Grierson.<sup>5</sup>

<sup>1</sup> *Bull. of the School of Oriental Studies*, Vol. II, p. 135.

<sup>2</sup> Cf. *Punjab Gazetteer*, 1904, Bahawalpur State, chapter on Education.

<sup>3</sup> Possibly related to [kəu] 'olive tree', which grows in abundance in this area.

<sup>4</sup> *Jhelum Settlement Report*, p. 6.

<sup>5</sup> *Op. cit.*, p. 433.

But the fact of Kə'huṛi being a distinct sub-dialect has not come to the notice of Grierson and Wilson. Grierson includes the dialect of this area in Dhanni which, as he says, is 'spoken not only over the Dhan (highlands north of Salt Range) but also in the portion of the Salt Range immediately to its south'.<sup>1</sup> There is no doubt that Kə'huṛi lies immediately to the south of the Dhan, but its dialect is distinct from Dhanni, as the following facts well show :—

(1) The first person oblique singular in Dhanni is [mɛ̃],<sup>2</sup> in Kə'huṛi it is [mâ], with a high-falling tone, a form characteristic of 'North-Eastern' Lahnda, and traceable to Prakrit accusative *maham*,<sup>3</sup> Vedic *māhyam*. In the Salt Range it is [mɛ̃] or [mɛ̃ ko].

(2) The Co-relative Pronoun third pers. oblique singular in Dhanni is [usɛ̃], in Kə'huṛi it is [usâ], probably formed analogically from [mâ].

(3) The post-position for the Personal Pronoun oblique singular *and* plural in Dhanni is [nũ] as in Panjabi and Central L. In Kə'huṛi it is different: the oblique singular has no post-position at all, it is simply [mâ], but the plural forms have the post-position [n] instead of [nũ], as the following examples will show :—

	Dhanni.	Kə'huṛi.
1st pers. obl. sing. ..	mɛ̃ nũ	mâ
1st pers. obl. pl. ..	əsɛ̃nũ	əsɛ̃n
2nd pers. obl. sing. ..	tɛ̃nũ	tudâ
2nd pers. obl. pl. ..	tusɛ̃nũ	tusɛ̃n

While the plural forms seem to indicate that the corresponding forms in Kə'huṛi are a later phase of the dialect, in which [nũ] has worn down to [n], in forms like [mâ] Kə'huṛi has preserved the more archaic flexional forms.

(4) As regards present participles of verbs ending in long [ɑ], in Dhanni, as in the neighbouring sub-dialect Pothwari, the long [ɑ] remains unchanged, but in Kə'huṛi it is changed to [ɛ̃]; thus Dhanni has [khɛ̃de] (plural), Pothwari<sup>4</sup> [khaɛ̃]; but Kə'huṛi [khɛ̃de]. This phonetic change is also regularly found in the neighbouring sub-dialect Awāṅkāri, while in Multani<sup>5</sup> also a few forms occur, e.g. [pɛ̃da], which have been noted as irregular possibly loan-words. The form [khɛ̃da] may be traced to an earlier [khāindā], which seems to be influenced by the corresponding causative form which actually occurs in the

<sup>1</sup> *Op. cit.*, p. 542, also cf. pp. 242, 433.

<sup>2</sup> *Op. cit.*, p. 544.

<sup>3</sup> Pischel, p. 292.

<sup>4</sup> *LSI, op. cit.*, pp. 546, 486.

<sup>5</sup> *Op. cit.*, p. 305.



oldest literary record of Lahnda, viz. the *Janam Sākhī* (see Appendix A). Thus on page 81 we find two sentences: [khavā-indā āhe] 'he was feeding'; (2) [malak hun kuch khavāindā hē] 'O Malak! will you give us something to eat?'

(5) There are several other points relating to accent, vocabulary, etc. which are peculiar to Kə'huḍī, and which will be dealt with in the sequel. Enough has been shown to establish the fact that Kə'huḍī is a distinct sub-dialect of Lahnda.

#### THE DISTINCTIVE FEATURES OF LAHNDĀ.

The following points indicate where Lahnda begins and Panjabi ends:—

(1) The first point which strikes an observer as soon as he begins to travel in any Lahnda-speaking area, is the stress on compound words, particularly proper<sup>1</sup> names. In Lahnda it is the second member of a compound that is stressed; while if the compound has three members, it is the last member that receives the stress. This sometimes affects the quantity as well as the quality of certain vowels. In Panjabi, however, the reverse is the case. If a compound word has two members, Panj. stresses the first member; while if the compound has three members, it stresses the first or the second member, but not the third, as L. does, as the following examples will show:—

L.	Panj.
rada 'kɪʃən	'rāda kɪʃən

Dr. Jain and I tested our pronunciations of this word at the kymograph (cf. the illustration facing p. 52). In the case of my pronunciation: (1) the tone and the stress of [kɪ] were higher, (2) the quantity of the vowel [ɪ] was distinctly longer, (3) there was no high-falling tone in [rɑ]. The reverse was the case in Jain's pronunciation,—the syllable [rɑ] had greater prominence, and had the high-falling tone. Again, in a word like [cak ram 'das] (name of a village) Panj. will stress [cak] or [ram], but L. will stress [das], so that the L. pronunciation will be [cak ram 'das], the vowel [ɑ] of [ram] being shortened. In several compound words even a syllable of the first member is dropped, or the quality of the vowel reduced, as the following contrast will show:—

L.	Panj.
mā 'sing	'mahā sing or mə'hā sing
zim 'dar	'zimi dar
mə 'raɟ	'maha raɟ or mə'haraɟ

<sup>1</sup> The above remark is confirmed by the observations of my friends Dr. B. D. Jain and Captain A. N. Sharma, I.M.S., both of whom are Panjabi speakers.

Figure 1

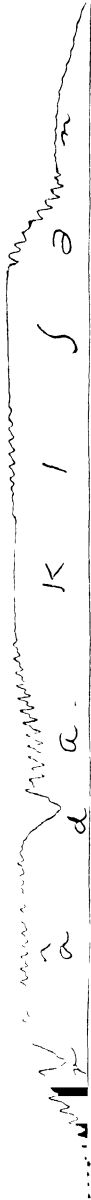
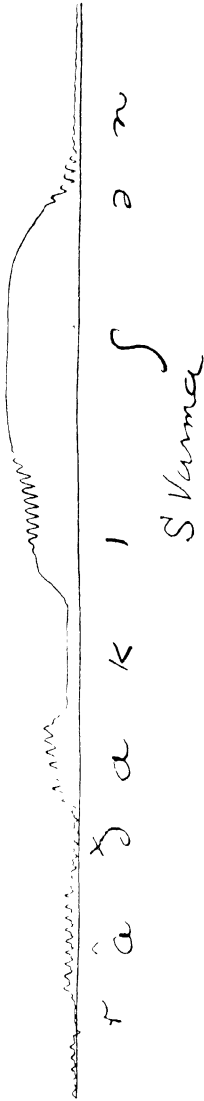


Figure 2

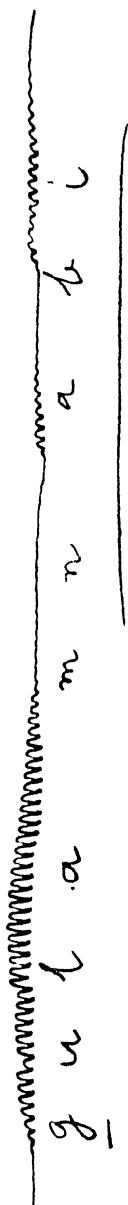


K, nographic tracings showing comparative pronunciation of the name [Rādhā-Kīśan] in Panjabi (Fig. 1) and Lahnda (Fig. 2).

Figure 1



Figure 2



Kymographic tracings showing comparative pronunciation of the name [ġhulām-Nabi] in  
Lahnda (Fig. 1) and Panjabi (Fig. 2).

The same is true of Muslim names :—

L.	Panj.
gūlam 'nabbi	gu'lām nābi
xudā 'bāxxəf	xu'dā bāxf
rəhim 'bibi	rə'him bibi
mābub 'begām	ma'bub begəm

I have noticed the same L. stress in Afghan pronunciation.

The above is true, however, only of determinative compounds or proper names ; in the case of Bahuvrihi compounds, L., like Panj., stresses the first syllable only :—

- [māmītṭha] .. A ceremony (lit. 'by which the mouth is sweetened') in which sweets are sent to the bride's home by the bridegroom's party before their departure for the marriage.
- [ 'nāṽ-purāṇā] .. A ceremony (lit. in which the new is taken and the old rejected) in which new fruits or products of the season are taken.
- [ 'bəri-buddā] .. A term of abuse (lit. one whose boat may be sunk).
- [ 'mā-moja] .. A term of abuse (lit. one whose mother may die).

It is interesting to note that the accent of compound words in L. has a curious affinity to Vedic accent—a fact noticed by Indian grammarians. Thus Patañjali has pointed out that the second member of a determinative compound, e.g. [indra-śātru-] (enemy of Indra) is accented, while if the same compound has a Bahuvrihi sense, its first member will receive the accent,<sup>1</sup> e.g. [ 'indra-śātru-] (lit. one whose enemy or destroyer is Indra).

But in the case of numeral Bahuvrihis we find an exception in Lahnda. In these compounds, the second, and not the first member, is stressed :—

- [barā-'dari] .. A room which has twelve doors.
- [barā-mā] .. A song in which the twelve months of the year are described.
- [cao-'masa] .. The rainy season, which consists of four months.

Even this exception finds a parallel in the Vedic accent of Bahuvrihi compounds, cf. [catur-akṣá-] 'four-eyed', [tri-nābhi-] ('having three navels').<sup>2</sup>

<sup>1</sup> Mahābhāṣya, Vol. I, p. 2, (Kielhorn) : *yadi pūrva-pada-prakṛti-svaratvaṃ tato bahuvrihiḥ, athāntodāttatvaṃ tatas tatpuruṣa iti*. Cf. Pāṇini, VI-2-1, VI-2-223. Macdonell : Vedic Grammar, pp. 92, 93.

<sup>2</sup> Macdonell, *ibid.*, p. 93.

The shortening of vowels in the first member of certain compounds has been also noticed in Pkt.,<sup>1</sup> cf. [itthiveya-]= [strīveda], probably due to the stress on the second member. Among modern languages, Marāṭhī has preserved<sup>2</sup> the old accent on compound stems, when those stems consist of verbal nouns, e.g. [sāghāḍo=san̄ghātaḥ].

It should be noted, however, that in the stress of single words L. and Panj. agree, both historically<sup>3</sup> as well as in their present pronunciation, e.g. [kū'ara, mō'saṭ, ku'bhar]. But the above-mentioned distinctive feature of L. in compound words is so striking that it is reflected even in the English pronunciation of Lahnda speakers, who tend to pronounce *station-master*, *sitting-room*; and from the English pronunciation of strangers in the Panjab I can nearly always judge immediately whether their mother-tongue is Lahnda or Panjabi.

(2) The second distinctive feature of L. is the initial *h* of several words which in corresponding Panj. or Hindi words begin with a vowel or *s*, e.g. [hik, hi'katṭha, he, ho, hassī, hōsaḍa] (*LSI*, VIII, p. 260) 'to be able'. Prakrit ['happū], 'a tear', Skr. [aśru-]. In such initials L. agrees with Sindhi, cf. [hiku], etc. This peculiar aspiration has been noticed in the Aśokan inscription discovered in the Lahnda-speaking area, viz. Shāhbāzgarhī,<sup>4</sup> cf. [hide]=L. [hidde], [hahati]=[aha].<sup>5</sup> The tendency to this aspiration, then, seems to be quite old.

(3) The third feature, viz. the preservation of the *s* future has been noticed by Grierson.<sup>6</sup> Lahnda, like Western Rāj. and Guj., in preserving this *s*, manifests a conservatism stronger than even certain dialects of Mahārāṣṭrī and Ardhamāgadhi. In which this *s* had been changed into *h*, cf. [hohimi]=L. [hosā], [gamihii], Ardhamāgadhi [gacchimi],<sup>7</sup> in which *s* entirely disappeared,=e.g. L. [gacchā].

(4) L. syntax shows certain peculiarities not to be met with in Panj.

(a) Corresponding to the Perfective in Slavonic, which, however, is formed by prefixes, e.g. Russian [znatī] 'to know', but [uznatī] 'to find out', there occurs in L., especially N., the auxiliary verb [ca] (lit. to lift, in the sense of 'up'), which can be used with any verb and in any tense or mood in the active voice, e.g. [mē usā ca ditṭa] 'I gave him away'; [ca ghin] 'take it up'; [mē usā utthe ca rakhsā] 'I will put it down there'. Panj. has no such universal form; like Hindi it expresses the idea

<sup>1</sup> Pischel, p. 83.

<sup>2</sup> Turner, *JRAS*, 1916, pp. 243, 244.

<sup>3</sup> Turner, *JRAS*, 1916, p. 230.

<sup>4</sup> Johansson: Shāhbāzgarhī, p. 129.

<sup>5</sup> Hultsch: *Inscriptions of Aśoka*: XXXVI.

<sup>6</sup> *Ibid.*, p. 234. He has pointed out the affinity of L. in *s* future with West. Rāj. and Guj.

<sup>7</sup> Pischel, pp. 363-365.

in several ways, e.g. by repeating a verb, as in [de ditta, le le] corresponding to the first two examples, cf. Hindi [de diā, le le]; sometimes by adding auxiliary verbs like [chadd, le], etc. as [rakh chadd, pi le], cf. Hindi [rakh choṛ or de, pi le]. L. can use [ca] with any verb in this sense. [ca] had originally the imperative sense, and then became a conjunctive part., cf. Māgha :

[purīm avaskanda lunīhi nandanam  
muṣāṇa ratnāni harāmarāṅganāḥ]. I, 51.

‘Having attacked the town, cut off Indra’s garden, stolen the gems, and carried off the wives of the gods’.—This [ca] subsequently seems to have become an auxiliary verb. In the passive voice, however, other auxiliary forms like [pīa, gīa], etc. are used, as [və'pīpīa] ‘was lost’.

(b) There are certain particles the very utterance of which at once confirms the speaker’s language to be Lahnda. Foremost among them is [vatt] ‘again, well’, and Panjabi speakers in order to parody Lahnda, often repeat the shibboleth,<sup>1</sup> [vatt ke pīa kə'renē ?] ‘Well, what are you doing?’ The word [vatt] generally means again, and is related to L. verb [vatt-] ‘to wander’, Skr. [vart-] ‘to roll or wander’, Sindhi [vatanu].

Another particle commonly used is [jaṛē] ‘that’, to introduce a direct speech, e.g. [us j'avab ditta jaṛē mər'saū] ‘he replied “I will beat you”’. This [jaṛē] is related to another L. particle [jaṛē] which means ‘that is’, and has affinity to Skr. [jñā] ‘to know’. Panj. uses [akhe] instead, cf. [akhiā] ‘he said’, Skr. [ākhyā] ‘to relate’.

### THE LAHNDA VOWELS.

Lahnda has ten vowel-phonemes, viz. [i, ɪ, e, ɛ, a, ʌ, ə, o, u, and ʊ]. The following diagrams will illustrate the tongue-position of these phonemes in relation to the cardinal vowels:—

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<sup>1</sup> I remember a Lahnda speaker in Gujrat (Panjab) whose surname was [vatt] bestowed upon him by the Panjabi speakers of the town.

Fig. A:—The approximate Tongue Positions of the Lahnda Vowels compared with those of Cardinal Vowels. Lahnda Vowels=squares.

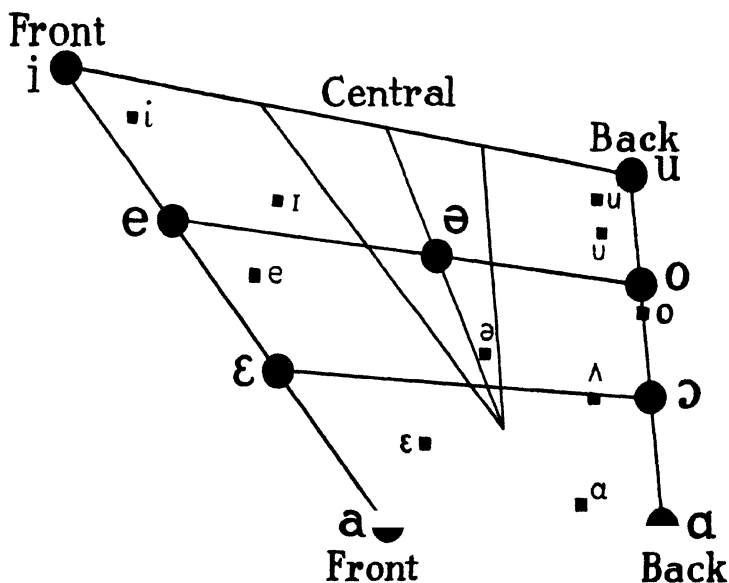
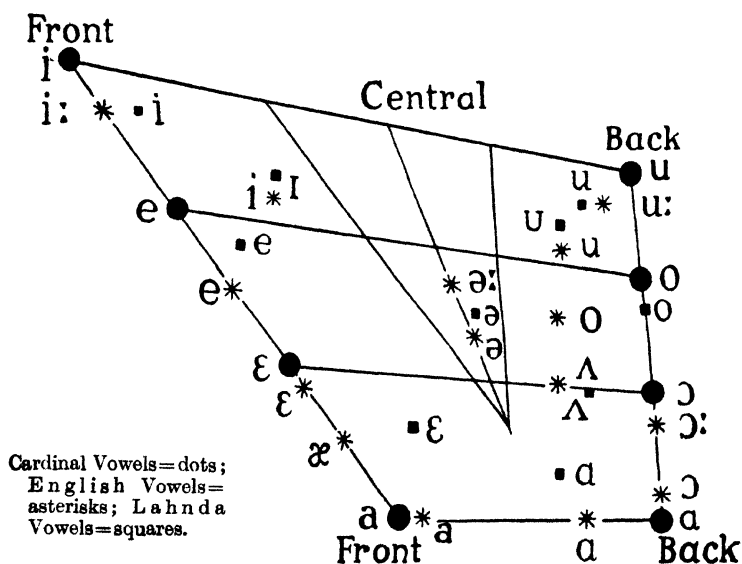


Fig. B:—The Tongue Positions of the Lahnda Vowels, compared with those of the Standard South English Vowels and Cardinal Vowels.



## FRONT VOWELS.

*Lahnda* [i].

In the articulation of [i] the front of the tongue is raised high towards the hard palate without producing audible friction. The tip of the tongue normally touches the lower teeth, except when the [i] is preceded by a retroflex consonant as in [thik] 'right', [dik] 'a full drink' (but [pir] 'pain', [tir] 'arrow', [cin] 'China', [kiri] 'ant'). The lips are unrounded.

Like all the *Lahnda* front vowels, [i] is situated behind the cardinal front position. The sound has no trace of diphthongization. Further examples: [cik] 'a cry', [likh] 'a louse', [lik] 'a line', [bin] 'a harp', [hiri] 'a threat', [nila] 'blue', [pila] 'yellow'.

The vowel [i] occurs in varying degrees of closeness under various conditions of tone and stress:—

(1) When pronounced with high-falling tone [i] is closer than when it is toneless, cf. [pī] 'grind' but [pi] 'drink', [vī] 'twenty' but [vi] 'also', [pīre] 'chairs' but [pire] 'pain' (oblique case).

(2) Stressed [i] is closer than the unstressed one, as may be noticed in compound words, cf. [fəkir 'din] 'name of a man' but [din] 'faith', [sɪr 'pir] 'headache' but [pir] 'pain'. Final [i] when unstressed sounds somewhat like [ɪ], cf. [zimi'dar] 'land-owner' but [zimi] 'land', though [zim'dar] is the more common pronunciation, in which [i] is entirely lost: [hari 'cand] 'name of a man' but [hari] 'name of a god'; [sita 'ram] 'name of a man' but [sita] 'Sītā, Rāma's wife'.

*Lahnda* [ɪ].

In the articulation of [ɪ] the front of the tongue is less raised and more retracted than for [i] (see the diagram on p. 56), cf. [kis] 'who', [mis] 'pulse', [khit] 'heel', [sikh] 'learn', [hik] 'one', [gid] 'mucus from the eyes', [lid] 'horse's dung'. As compared to [i], [ɪ] is distinctly lax and effects semantic difference. It should therefore be taken as a separate phoneme, cf. [cɪr] 'late' but [cir] 'partition of the hair', [chit] 'a drop' but [chit] 'chintz', [likh] 'write' but [likh] 'a louse', [sikh] 'learn' but [sikh] 'a spit (iron bar for roasting)'. [ɪ] is laxer than the pre-tonic or unstressed [i], e.g. in [siri 'kɪʃən] 'name of a man', the [ɪ] of the syllable [sɪ] is not identical with the weakened [i] of the syllable [ri]. A final [ɪ], as in English [beɪbɪ] 'baby', does not exist in *Lahnda*: in that position the sound used is always a member of the phoneme [i].

Like [i], [ɪ] occurs in various degrees of closeness under different conditions of tone and stress:—

(1) When pronounced with high-falling tone [ɪ] is closer, cf. [gid] 'a vulture' but [gid] 'pus from the eye', [likh] 'do write (emphatic)' but [likh] 'write (unemphatic)'.



(2) When followed by retroflex consonants [ɪ] is distinctly more open and somewhat centralized, cf. [mɪtti] 'clay' but [mitti] 'date', [pɪt] 'beat the breasts' but [pit] 'bile', [kɪdde] 'an exclamation in the Kabaḍḍi game' but [kidde] 'where'. On the other hand, [ɪ] is closer than the normal type before [l] and [ɳ], cf. [milli] 'met', [kɪppɛ] 'how?' but cf. [mitti] 'date', [mis] 'a kind of lentils', [kɪtthe] 'where?'.

### *Lahnda* [e].

In the articulation of [e] the front of the tongue is less raised than for [ɪ] (cf. the diagram on p. 56). The lips are slightly spread. The sound has no trace of diphthongization, cf. [tɛkɔ] 'name of a man', [dhɛɔ] 'half-a-pice', [jɔ'lebi] 'name of a pastry', [kheri] 'a kind of shoe', [chɛk] 'a hole', [sɛk] 'warmth', [dɛg] 'a large kettle'.

Like [i] and [ɪ], the vowel [e] occurs in varying degrees of closeness under various conditions of tone and stress:—

(1) When pronounced with high-falling tone [e] is closer, cf. [sɛre] 'laurels' but [sere] 'name of a weight (oblique case)', [hɛ] 'this' but [he] 'is' (Multani dialects), [chɛ chɛ] 'exclamation for calling a goat' but [che] 'six'.

(2) Final [e] before or after stress sounds somewhat like [ɪ], cf. ['vɛtre dɔ] 'of the vehicle' ['mɪfre dɔ] 'of a cook', [mɛze'dar] 'palatable', [ʃɛr] 'â] 'name of a man', [pɛe 'kɔʃ] 'screw driver'. In the phrase [kɛpe pɛpe] 'which pastries?' we have three [e]'s in varying degrees of closeness.

### *Lahnda* (ɛ).

In the articulation of [ɛ] the front of the tongue is raised but to a less extent than for [e]. The lips are neutral, the mouth is fairly wide open, the lower jaw, especially in stressed syllables, comes down considerably, e.g. [vɛn] 'they may go', [tɛr], 'a young mare', [pɛsa] 'a pice', [kɛr] 'care', [pɛr] 'foot', [sɛl] 'rambling'.

The phoneme [ɛ] undergoes a variety of changes under various conditions of stress. When stressed, ɛ is more open, cf. [trɛ] 'three' but [trɛ pɛsɛ] 'three pice', [ɔrɛ sɛ 'trɛ] 'three hundred and three'. On the other hand, with high-falling tone [ɛ] is not so open, cf. [trɛ] 'be afraid' but [trɛ] 'three', [lɛ] 'descend' but [lɛ] 'take (central dialects)', [kɛ] 'tell' but [kɛ] 'vomiting'.

In syllables immediately preceded or followed by stress, the vowel is so close that it may be taken as a subsidiary member of the phoneme [ɛ], cf. [ʃɛ] 'victory' but [ʃɛ 'dai] 'name of a woman', [ʃɛ 'ram] 'name of a man' but cf. [ʃɛ ram 'ʃâ] where [ɛ] is not immediately followed by stress.

## BACK VOWELS.

*Lahnda* [ɑ].

In the articulation of [ɑ] the tongue is low down in the mouth; such raising as there is being by the back of the tongue towards the soft palate.

Lahnda [ɑ] is slightly more forward than the English [ɑ] in [fɑðə] = 'father'. The mouth, in the articulation of [ɑ] is opened wider than in the case of [ɛ], both the lips are quite neutral, and neither of them is spread. Nor is there any rounding of the lips, cf. [rɑʃ] 'a kingdom', [kɑl] 'famine', [cɑr] 'four', [hɑl] 'condition'.

An important subsidiary member of this phoneme is the final unstressed [ɑ] of polysyllables, as in [cɑlɑ] 'custom', [sɑrɑ] 'the whole', [kɑlɑ] 'black'. It also occurs in corresponding Hindustani words. This final [ɑ] is different from [ʌ] as in [kʌpɾɑ] 'cloth', [pʌrdɑ] 'purdah'. The acoustic difference between these can be noticed without difficulty. This final vowel is only a *slightly centralized* [ɑ], and even then does not belong to the central area proper. It is more open than even the English [ʌ] in [bas] = 'bus'. It should be borne in mind that this subsidiary member occurs only in unstressed position; when final [ɑ] is stressed, it maintains the quality of the principal member, cf. [cə'lɑ] 'set in motion' but ['cɑlɑ] 'custom', [cʉ'rɑ] 'steal' but ['cʉrɑ] 'powder'. The subsidiary member is used when preceded or followed by stress, cf. [dɑs] 'a servant' but ['mêḍɑ dɑs] 'my servant', [rɑm] 'name of a god' (Rāma) but [rɑm dɑs] 'name of a man'.

*Lahnda* [ʌ].

In the articulation of [ʌ] the tongue is slightly raised at the back, but the point of the highest raising is a little advanced towards the centre (cf. the diagram on p. 56), cf. [ʌɪ] 'to-day', [ʌsi] 'we', [rʌb] 'God', [dʌk] 'stop', [tʌbbər] 'family'. When pronounced with high-falling tone [ʌ] is slightly closer, cf. [dʌb] 'bury' but [dʌb] 'name of a grass', [vʌḍḍe] 'old people' but [vʌḍḍe] 'cut'.

As a concomitant of stress, [ʌ] often represents an advanced [ɑ], cf. [ʌs dɑ] 'his' but [ʌs dʌ 'ghoɾɑ] 'his horse', [sonɑ] 'gold' but [sonʌ 'bai] 'name of a woman'. In Panjabi the pronunciation of the same word would be ['sonɑ 'bai].

*Lahnda* [ə].

[ə] is the 'central' vowel, the tongue-position being higher and more advanced than for [ʌ] (cf. the diagram on p. 56).

It is generally a concomitant of stress and does not occur in isolated monosyllabic words; but as it occasionally effects semantic difference, it may be taken as an independent phoneme, cf. [kørde] 'knife (oblique case)' or 'doing (plural)' but [kār de] 'do (for somebody else)', [səḍke] 'I am devoted to you' but [səḍke] 'having called', [sərke] 'road (oblique case)' but [sārke] 'having burnt', [məlke] 'a landlord (oblique case)' but [mālke] 'having rubbed', [həlke] 'a mad dog (oblique case)' but [hālke] 'having moved'.<sup>1</sup>

As a concomitant of stress, [ə] is sometimes a centralized [ɑ], and sometimes a centralized [ʌ]:—

(1) [ɑ], cf. [us dɑ] 'his' but [us də 'ʃakət] 'his child', [ʼcə de] 'give it (away)' but [mā cə de] 'give it (away) to me'.

(2) [ʌ], cf. [ʌṭh] 'eight' but [əṭhārā] 'eighteen', [sət] 'seven' but [səṭārā] 'seventeen', [cʌl] 'move' (intransitive) but [cə'lɑ] 'set in motion', [ʌm] 'mango' but [əm'eʊr] 'mango powder'.

### *Lahnda* [o]

In the articulation of Lahnda [o] the back of the tongue is further raised towards the soft palate. It is a close, rounded vowel, and is the only Lahnda vowel which is on the 'cardinal line' (cf. the diagram on p. 56). It has no trace of diphthongization, though it is not so close as French [o], cf. [ghora] 'horse', [chole] 'gram', [do] 'two', [dor] 'a string'. The vowel [o] occurs in varying degrees of closeness under various conditions of tone and stress:—

(1) With high-falling tone it is closer, cf. [rô] 'anger' but [ro] 'weep', [ko 'hala] 'name of a town' but [kô] 'kill', [o] 'O!' but [ô] 'that'.

(2) When preceded or followed by stress, it becomes considerably closer, and sounds like [u], cf. [ghor 'daor] 'horse-race' but [ghora] 'a horse', [do 'pêr] 'noon', [do 'aṭhi] 'exchange-marriage', [do-'citta] 'in a dilemma' but [do] 'two'. In these examples, where [o] is followed by stress, it may be taken as a subsidiary member of the phoneme [o].

When preceded by stress, it is closer than the normal [o], but not so close as the above, cf. ['râdo dɑ] 'of Râdhā (name of a woman)', ['mitro dɑ] 'of Mitrā (name of a woman)'.

### *Lahnda* [u]

In the articulation of [u], the back of the tongue is raised much higher than for [o] (cf. the diagram on p. 56). It is a

<sup>1</sup> The [ʌ] phoneme occurs in these examples only in a word which is a compound of two originally separate words.

lax vowel, though it has no trace of diphthongization, cf. [suk] 'be dried', [tur] 'start', [dhuk] 'meet', [khud] 'a hole'.

With high-falling tone [u] becomes closer, cf. [bôd] 'wisdom', [dôd] 'milk', [sôd] 'ginger', [ôn] 'they'.

It is similarly closer when stressed, e.g. before double consonants, cf. ['sukka] 'dry' but [suk] 'to be dried', ['kutta] 'a dog', ['bôssa] 'unornamented', ['nunnu] 'dumb'.

[u] is more open and obscurer before retroflex consonants, cf. [kut] 'beat' but [kutta] 'a dog', [phut] 'breach' but [phul] 'flower', [bud] 'be drowned' but [buk] 'a mouthful', [pur] 'mill-stone' but [pul] 'a bridge'.

### *Lahnda* [u].

In the articulation of [u] the back of the tongue rises a little higher than in the case of [ʊ] (see diagram), while the rounding of the lips is more marked.

The difference between [u] and [ʊ] is significant, effecting semantic change, and hence they are different phonemes, cf. [kuri] 'a liar (feminine)' but [kuri] 'a girl', [ruri] 'dung-hill' but [ruri] 'fried', [sur] 'a pig' but [sur] 'a tune'.

With high-falling tone [u] is closer, cf. [phûr] 'a mat', [gûra] 'thick', [ûg] 'a nap'. It is more open when pretonic, cf. [bôddu] 'a simpleton' but [budu] 'ram' 'name of a man', [rôdu] 'jar' 'a maudlin fellow'.

### THE LAHNDÁ DIPHTHONGS.

Lahnda has 31 diphthongs, viz.: [ei, ai, ɔi, ɔi, oi, ui; ie, ɛe, æe, ɛe, ɔe, ue; iɛ, iɑ, iɑ, eɑ, oɑ, uɑ, uɑ; io, io, eo, ɔo, ɔo, ɛo; iu, eu, ɔu, ɔu, ɛu].

These diphthongs vary in their degree of 'diphthongization', and in some cases it becomes difficult to determine whether they are diphthongs or two separate vowels. For instance, if we compare [mɛ ai] 'I came (feminine)' with English [ɪt ɪz aɪ] 'It is I', the [ai] of Lahnda sounds as two vowels to some hearers, the second element of [ai] being more complete than the second element of the English [aɪ]. Nevertheless, the present writer is inclined to take a sound like [ai] as a diphthong, because (1) the total length of [ai] is shorter than the two isolated vowels [a] and [i] as in ['ɑ vi] 'do come', ['ɑ i giɛ] 'he has come after all'; (2) each element of [ai] is shorter than the isolated [a] and [i] as in the above examples, while the first element is closer; (3) in isolated words or abnormally slow speech they may sound as separate vowels, but in normal connected speech they sound as diphthongs even to many foreign hearers; (4) most of these diphthongs are incidents of flexion and generally constitute the terminations of words. A word like [nai] 'barber'

would be felt as incomplete if pronounced [nɑ-i] or if pronounced like the English [naɪ] 'nigh' which may be pronounced [nai], [nae] or [næ]. Of these 31 diphthongs, the following never begin a word; they are always terminational:—

[ei]	as in	[ɟɛ 'dei]	'name of a woman'.
[ɔi]	„ „	[gɔi]	'went'.
[ui]	„ „	[ɖui]	'second', [sui] 'red'.
[ie]	„ „	[kɔpie]	'let us cut'.
[ɛe]	„ „	['kɛe nɔl]	'owing to nausea'.
[ɔe]	„ „	[gɔe]	'went'.
[ue]	„ „	[ɖue]	'second' (oblique), [bue] 'doors'.
[iɛ]	„ „	[piɛ]	'fallen'.
[ia]	„ „	[ɟia]	'O heart', [pəpɪɑ] 'name of a bird'.
[ea]	„ „	[bhəɾea]	'a sister's son', [bêɑ] 'stale'.
[oa]	„ „	[khoa]	'milk-pudding', [côɑ] 'fountain'.
[ua]	„ „	[ɖuɑni]	'a two-anna piece'.
[uɑ]	„ „	[ɖuɑ]	'second', [sua] 'red'.
[io]	„ „	[pio]	'drink', [pio] 'grind'.
[iɔ]	„ „	[ghio]	'ghee', [ɖio] 'give' (emphatic).
[eo]	„ „	[deo]	'give' (non-emphatic).
[əo]	„ „	[rəo]	'live'.
[ɛu]	„ „	['kɛu nɔl]	'owing to nausea'.
[au]	„ „	[khaʊ]	'a glutton'.
[ɔu]	„ „	[gɔu]	'cow'.
[əu]	„ „	[kəu]	'name of a tree'.

Of the following 7 diphthongs it may be said that they can begin a word, but strictly speaking, they are whole words by themselves, formed by the coalescence of a root and a termination:—

[əi]	'was' (feminine).
[ɑi]	'(she) came' (feminine singular).
[ae]	'they came'.
[əe]	'they were'.
[oɐ]	'O!'
[ɑo]	'come, sir!'
[iɑ]	'was' (masculine).

The following 3 can stand at the end of an initial syllable, but even they cannot be in the beginning of a word:—

[ɔo]	as in	['nɔokər]	'servant'.
[ɔu]	„ „	[pɔuɑ]	'sandals'.
[iu]	„ „	[ɖiut]	'a wick'.

A striking feature of the vowel-system of Lahnda is the copious number (viz. 10) of its rising diphthongs, when the first element is toneless and unstressed:—

[ɔi]	as in	[gɔi]	'she went'.
[əi]	„ „	[rəi əi]	'she had lived'.
[ui]	„ „	[d̪ui]	'second'.
[ɛə]	„ „	[gɛə]	'they went'.
[iɑ]	„ „	[giɑ]	'he went'.
[uɑ]	„ „	[duɑni]	'a two-anna piece'.
[io]	„ „	[ghio]	'ghee'.
[ɔo]	„ „	[pɔo]	'fall'.
[iu]	„ „	[piu]	'father'.
[ɔu]	„ „	[gɔu]	'cow'.

It must be borne in mind, however, that these 'rising' diphthongs vary in their degree of 'rise', the higher sonority of the second element of some of these diphthongs may even be counterbalanced by the stronger stress on the first element, e.g. [io] in [ghio] 'ghee' and [iɑ] in [piɑ] 'give to drink' have no doubt a rising perceptibility, but [io] in [d̪io] and [iɑ] in [p̪iɑ] 'fallen' are falling diphthongs.

The following 5 are falling diphthongs :—

[ai]	as in	[nai]	'barber'.
[oi]	„ „	[hoi]	'become'.
[ɛə]	„ „	[hɛə]	'alas !'.
[ao]	„ „	[ʒao]	'go'.
[au]	„ „	[khaʊ]	'a glutton'.
[əu]	„ „	[kəʊ]	'name of a tree'.

Of the remaining 15 diphthongs we cannot say definitely whether they are rising, falling, or 'even' diphthongs—the difference of perceptibility between the first and the second element being not very striking :—

[ei]	as in	[mə'trei]	'step-mother'.
[ui]	„ „	[d̪ui]	'second' (feminine).
[ie]	„ „	[kɛpie]	'let us cut'.
[ɛe]	„ „	[kɛe]	'owing to nausea'.
[əe]	„ „	[o 'gɛə əe]	'they had gone'.
[ue]	„ „	[due]	'second' (plural masculine).
[iɛ]	„ „	[giɛ]	'is gone'.
[iɑ]	„ „	[gɔpiɑ]	'O talkative fellow'.
[eɑ]	„ „	[seɑ]	'soaked'.
[oɑ]	„ „	[khoa]	'milk pastry'.
[uɑ]	„ „	[duɑ]	'second'.
[io]	„ „	[sio]	'sew'.
[eo]	„ „	[d̪heo]	'obtained'.
[əo]	„ „	[ʔit̪the əo]	'have you been here ?'.
[ɛu]	„ „	[ʒɛu]	'name of a man' (oblique).

The following table will show how far Lahnda diphthongs effect semantic difference:—

<p>[e] . . . (i).          [ɛ 'deis] 'it is [ɛ          'dei] ' (name of a          woman).          [dai] 'a nurse'.          [ɛ 'dai] 'name of          a woman'.          [d̥ɔi] 'curd'.          [doi] 'only two'.          [dui] 'second' (fe-          minine).</p>	<p>[i] . . . (e).          [sie] 'let him sow'.          [see] 'hundred only'.          [s̄e] 'date of mar-          riage' (oblique).          [sae] 'hatched'.          [s̄e] 'endured'.          [soe] 'vegetable          greens' (oblique).          [sue] 'large needles'.</p>	<p>[ɪ] . . . (ɛ).          [d̥hiɛ] 'has been          obtained'.  <hr/>         [ɪ] . . . (a).          [d̥hiɑ] 'obtained'.          [d̥heɑs] 'he has          obtained'.          [d̥hoa] 'only the day          preceding the mar-          riage day'.          [d̥huɑ] 'help to load'.          [d̥huɑ] 'anus'.</p>
<p>[i] . . . (o).          [pio] 'drink'.          [pio] 'father'.          [peos] 'it is his          father'.          [pao] 'put'.          [pao] 'fall'.          [p̄eo] 'the dawn'.</p>	<p>[suɪ̯] 'sewing'.          [seu] 'hundred' (oblique).          [s̄u] 'hare' (oblique).          [ḡau] 'a cow'.          [s̄u] 'enduring'.</p>	

It will be clear from the above table, that of the 31 diphthongs, there are only five, viz.: [ei], [eq], [eo], [iu] and [ɔu] which by themselves fail to effect semantic difference. The first four of them require an additional grammatical suffix in order to be significant.

#### *Lahnda* [ei].

[ei], as in [bhe'fei] 'niece' (sister's daughter), [mæ'trei] 'step-mother', is a falling diphthong, the stress and the sonority being higher in the first element [e], though the quantity of this element seems to be shorter and its quality closer than that of the normal [e] as in [devi] 'goddess'. The second element [i] is similarly shorter in quality and weaker in sonority than the normal Lahnda [i] as in [devi].

[ei] occurs at the end of certain feminine words as [mæ'trei] 'step-mother', [bhe'fei] 'niece', [dei] for [devi], though in this case [ei] has now been considerably superseded by [ɔi], [d̥ai] being the more frequent pronunciation.

*Lahnda* [ai].

In its purest form, [ai] occurs as a diphthong when accompanied by the high-falling tone, where the transition from [a] to [i] is immediate, cf. [phâi] 'gallows', [bâi] 'pole of a bedstead', [râi] 'sowing-time'. But even when it is toneless, the transition seems to be quick enough for a diphthong, cf. [mê ai ā] 'I have come'.

The first element [a] of [ai] is closer than the normal Lahnda [a] as in [aɔa] 'come on'. In slow speech, however, it may be a question whether [ai] is a diphthong or a group of two syllables, e.g. in [nai aia], spoken slowly, [nai] may in certain cases be taken as a dissyllable. But at the normal rate of speech, [ai] will be monosyllabic and therefore a diphthong.

When followed by stress, as in compound words, [ai] is a pure diphthong, cf. [bhâi] 'brother' but [bhâi 'cara] 'brotherhood', [lai] 'attached' but [lai 'lag] 'a blind follower'. The first element becomes closer and is centralized.

*Lahnda* [Δi].

[Δi] occurs as a pure diphthong both in stressed and unstressed position, cf. [gəð'vΔi] 'valet', [hər 'dΔi] 'name of a woman', [dhe pai] 'fallen', [mar gai] 'died'.

It is difficult to determine whether in the stressed position [Δi] is a rising or a falling diphthong, for though the [Δ] has the stress, [i] gains in length.

The Δ in [Δi] is slightly closer than the normal Lahnda [Δ], cf. [huɔ 'gΔi] 'it is now rotten'. When occurring between two stresses it is even still closer, cf. [dhe pai də 'pattən] 'a shabby place'.

*Lahnda* [əi].

[əi] occurs generally with high-falling tone, and, strictly speaking, should be taken as another phase of [Δi]. But as the first element of [əi] is considerably closer than the [Δ] of [Δi], it may be considered as a separate diphthong, cf. [rêi] 'lived', [vêi] 'account-book', [êi] 'was', [sêi] 'endured', [kêi] 'shovel'.

Even when the tone is lost after a stress, the first element slightly maintains its closeness, and may therefore be transcribed as [ə], cf. [o vɔɔ rei ə] 'she has reached', [e mēdi kəi ə] 'this is my shovel'.

*Lahnda* [oi].

[oi] is a pure diphthong both in toned and toneless syllables, cf. [kôï hoi] 'slaughtered', [môï] 'too much attached to family', [moi] 'dead' (term of abuse to young girls), [lôï] 'the Lohri festival', [loi] 'a blanket', [khôï] 'snatched', [rôï] 'peevish'. The [o] of [oi] is closer and shorter than the normal Lahnda [o] in [khot] 'allay', [cor] 'thief'.



In occasional emphatic speech, however, [o] is considerably lengthened, and then [oi] is no longer a diphthong, but a disyllabic group, cf. [e gal kadi 'ho:i e] 'has this thing ever occurred?', [mo:i] 'naughty girl!'

### *Lahnda* [ui].

The [u] of [ui], as in [sui] 'needle', [dui] 'second', is closer and shorter than the normal Lahnda [u] as in [sur] 'a pig', [dur] 'distant'. In high-falling tone it is a falling diphthong, cf. [sûi] 'red', [khûi] 'a well', [phirûi] 'an ulcer'.

It occurs only at the end of words, but sometimes an abbreviated form of the preposition [vic] 'in' is added to it, and then it becomes [uic]. In that case the first element of [ui] is somewhat lowered, cf. [duic] 'in the second' (feminine), [suic] 'in the needle', [khûic] 'in the well'.

### *Lahnda* [ie].

[ie] is an uncertain diphthong, and its first element is often so quickly pronounced that it gives the impression of a semi-vowel. After the 'terminal plosives', i.e. after the labials and the velars, it tends to maintain its monosyllabic quality, as in ['kapie] 'let us cut', ['chakie] 'let us eat'. The prominence of [ie] here gradually rises without a break, but after other consonants, and after the high-falling tone, [ie] tends to be disyllabic, cf. [sadie] 'let us call', [bacie] 'let us avoid', [bânie] 'let us bind', [pârie] 'let us read'. In these examples [ie] may properly be transcribed as [ije].

### *Lahnda* [ɛɛ].

This diphthong also occurs at the end of certain words due to the Lahnda termination [e], eg. ['kɛɛ nal] 'on account of nausea', [ʃɛɛ nal] 'with Jai (name of a man)'. As a doubtful case it may occur when the particle [e] 'only' is added to a word ending in [ɛ] as in [sɛɛ rɛpɔjɛ] 'only a hundred rupees'. Here a minimum of prominence between [sɛɛ] and [e] is not unlikely, for these are felt by the speaker as two separate words.

In normal fluent speech a group of the two words [ê] 'is', [e] 'or' makes the single diphthong [êe]; here [e] being an abbreviation of [ve] 'or', as in [tusɔɔ kol êe ke nɔi] 'is it with you or not?'. But in occasional emphatic utterance [ê e] will form separate syllables.

### *Lahnda* [ae].

[ae] is evidently a diphthong in high-falling tone, e.g. in [râe] 'way' (oblique), [sâe] 'breath', [ghâe] 'grass' (oblique). But it is also a pure diphthong when toneless, pretonic, stressed

or unstressed, e.g. ['hæ mæ] 'O mother!', [kɪræ 'dɑr] 'tenant', [jæ 'dɑd] 'property'.

*Lahnda* [ʌe].

[ʌe], as in [gʌe] 'went', is a rising diphthong. Its [ʌ] is more open than the [ʌ] of [gʌi], though after a stress it seems to be as close as the [ʌ] of [ʌi], cf. ['mɑr gʌe] 'they are dead', ['mɑr gʌi] 'she is dead', ['dʰɛ pʌe] 'they fell down', ['dʰɛ pʌi] 'she fell down'.

[ʌe] occurs at the end of plural past participles as [gʌe] 'went', [pʌe] 'fallen', [dʰʌe] 'obtained'.

*Lahnda* [œ].

Like [ʌe], [œ] occurs at the end of words, but most frequently with high-falling tone, as in [rœ] '(they) lived', [sœ] 'endured'. It also occurs as an independent word as [œ] 'they were' and when, after a stress, [œ] loses the tone, it is still distinct from [ʌe], as in [o 'itʰœ] 'they were here' but cf. ['mɑr gʌe] 'they died'.

The [œ] of [œ] is more open than that of [œi], and the present writer can feel a distinct muscular tension in the articulation of the latter.

*Lahnda* [oe].

[oe] is a pure diphthong with high-falling tone, e.g. [gœ] 'cakes of cow's dung', [rœ nɔl] 'with anger'; but even without the tone it may be taken as a diphthong, for its first element is shorter and closer than the normal Lahnda [o], e.g. [doe] 'both', [hoe] 'may become', [moe] 'they died', [boe boe] 'women's exclamation in mourning'. [oe] is parallel to [oi], as both are linked grammatically as parallel terminations. Like [oi], it occasionally becomes dissyllabic in emphatic or interjectional utterance, cf. [ho:ɛ tɛ tã nã] 'it can happen *if* such a thing takes place', [ure ɑ o:ɛ] 'O, come here!'

*Lahnda* [ue].

The [u] of [ue], as in [sue] 'large needles', [due] 'others', is shorter than the normal Lahnda [u] as in [kur] 'a lie', [dur] 'distant'. With high-falling tone it is a falling diphthong, as [bûe] 'doors', [khûe] 'well' (oblique).

Like [ui] it occurs only at the end of words, but before the post-position [c] (cf. p. 66) its first element is somewhat lowered, cf. [sue] 'canals' but [suec] 'in the canal', [duec] 'in the second' (masculine).

*Lahnda* [iɛ].

The second element of [iɛ], as in [giɛ] 'is gone', is closer than the normal Lahnda [ɛ] in [kher] 'welfare', [tɛr] 'a young mare'.

[iɛ] occurs as a termination of the present tense, cf. ['khāda piɛ] 'he is eating', ['kar saɽiɛ] 'he has done', [turgie] 'he is gone', ['itthe i riɛ] 'has he remained here?'

*Lahnda* [ia].

[ia], like [ie], is an uncertain diphthong, because its first element tends to be a semi-vowel. It sounds more like a diphthong after breathed than before voiced consonants. cf. [gapiɑ] 'O talkative fellow', [chakiɑ] 'O glutton', [chaliɑ] 'a deceiver', [kattiā] 'spun things' (feminine) but [pāriā] 'read', [lābiā] 'obtained', [saɽiā] 'burnt', [dabiā] 'buried', [sadiā] 'called', [bāniā] 'fastened'.

*Lahnda* [iɑ].

[iɑ] is sometimes a rising and sometimes a falling diphthong. In transitive or causative forms like [liɑ] 'bring', [piɑ] 'give to drink' or in nouns like [piɑr], we have the first variety, the second element being more perceptible. But when the first element has the tone or the stress, it is a falling diphthong. cf. [liɑ] 'descended', [piɑ] 'fallen', [giɑ] 'gone', [iɑ] 'had been'.

The latter variety occurs in past participles.

*Lahnda* [ea].

In high-falling tone the monosyllabic quality of [ea] is evident, cf. [sənēɑ] 'a message', [bēɑ] 'stale'. It is less apparent, however, when [ea] is toneless, as in [seɑ] 'soaked', [dheɑ] 'obtained'. Nevertheless, as prominence descends without interruption even in these examples, [ea] may be taken as a diphthong. Moreover, the [ɑ] of this [ea] is closer than the normal final [ɑ] of Lahnda polysyllables as in ['calɑ] (cf. p. 59) and thus further indicates a weaker prominence.

*Lahnda* [oɑ].

In high-falling tone the monosyllabic quality of [oɑ] is evident, cf. [gōɑ] 'a cake of cow's dung', [cōɑ] 'a fountain'. But it is also fairly apparent in [khoɑ] 'milk pastry', [doɑ] 'only two', [tōɑ] 'a pit'.

When toneless, [oɑ] is an even diphthong, but when accompanied by the tone, it is a falling diphthong, as in [cōɑ].

Note, again, how in [ōɑ] 'that very' two different words have given a single diphthong.

*Lahnda* [ua].

[ua] occurs medially as in [kuara] 'bachelor', [juaria] 'a gambler', [suar] 'Monday', [juar] 'oats', [rua] 'a particle'.

The [u] of [ua] is a little closer than the normal Lahnda [u] as in [tur] 'start'.

[ua] also occurs finally in the vocative case and in certain transitive verbs, as [guruua] 'O Guru!' (contemptuous), [ullua] 'O owl!' (stupid), [sua] 'make (one) sleep'. It is always a rising diphthong.

*Lahnda* [ua].

The diphthong [ua] occurs only in the final position, while its medial parallel is sometimes [ua], cf. [dua] 'second' but [duani] 'a coin of two annas', [jua] 'gambling' but [juaria] 'gambler'. In these examples [ua] apparently arises from the weakened prominence of [u], and its first element becomes almost semi-vocalic.

When accompanied by tone, [ua] is evidently a diphthong, cf. [sûa] 'red', [bûa] 'door', [cûa] 'a rat'.

The [u] of [ua] is slightly more open than the normal Lahnda [u] as in [dur] 'distant'.

*Lahnda* [io].

[io] as a diphthong occurs at the end of certain verbal forms as [pio] 'drink', [pio] 'grind', [sio] 'sew'. It also occurs in the word [dhio] 'O daughters!' In certain cases, however, the glide between the two elements sounds somewhat like a weak semi-vowel, e.g. [kuri<sup>io</sup>] 'O girls', [vâdi<sup>io</sup>] 'cut', [bâni<sup>io</sup>] 'bind', [cali<sup>io</sup>] 'start'.

*Lahnda* [io].

[io] as a diphthong occurs in the pronominal suffix [os] after [r], [l], [f] and [n] as in ['karios] 'he did', ['dalios] 'he crushed', ['su<sup>f</sup>ios] 'he heard', ['bânios] 'he fastened'. But [io] does not occur as a diphthong after plosives, e.g. ['ditjos] 'he gave', ['dithjos] 'he saw', ['chakjos] 'he ate', ['lâbhjos] 'he found'.

The diphthong [io] also occurs at the end of some nouns as [pio] 'father', [ghio] 'ghee', (cf. p. 63).

*Lahnda* [eo].

[eo] occurs as a terminational diphthong in fluent normal conversation, e.g. [dheo] 'obtained' in [ke dheo ne] 'what did you obtain?', [seo] 'soak', [deo] 'give' (unemphatic). The [e] of [eo] is closer than the normal Lahnda [e] in [de] 'give' (thou).

*Lahnda* [ao].

[ao] occurs as a common diphthong, as in Hindustani and Panjabi, at the end of Imperative 2nd person plural, e.g. [jao] 'go', [ao] 'come', [khaɔ] 'eat', [na~o] 'bathe', [rãora] 'straight ahead', [jao ji jao] 'get away'.

*Lahnda* [Δo].

[Δo] is a frequent diphthong occurring medially and at the end of words, cf. [ˈnaokər] 'servant', [ˈsΔoda] 'a bargain', [sΔo] 'a hundred'. The second element of this diphthong is more open than the English [u] in [naʊn] (noun) and belongs to the [o] rather than to the [u] area, with which it is likely to be confused.

*Lahnda* [əo].

[əo] always occurs in high-falling tone, and is a substitute for [Δo] when this tone occurs, e.g. [rəo] 'live' (2nd pers. Imperative), [səo] 'endure', [bəo] 'sit', [ləo] 'descend'.

*Lahnda* [iu].

[iu] is a diphthong in which no fricative element is audible, as it is in the English word [dju] 'due', e.g. [jiuɸ] 'to live', [siuɸ] 'to sew', [piu] 'father' (oblique), [dhiu] 'daughter'.

*Lahnda* [ɛu].

The termination [u] of the oblique case gives the diphthong [ɛu], as [kɛu di də'va] 'a medicine for nausea', [jɛu də 'ghar] 'the home of Jai'.

The [ɛ] of [ɛu] is closer than the normal Lahnda [ɛ] as in [ber] 'berry'.

*Lahnda* [au].

[au] occurs as a diphthong (1) when [u] is a termination in the oblique case, as in [bhi'rau nal] 'with his brother', (2) when [u] occurs as a termination to show some habit, often undesirable, as in [khaɪ] 'a glutton', [ɛau] 'an instigator', [kə'mau] 'a bread-winner'.

*Lahnda* [Δu].

[Δu] also occurs frequently in the final position, as [gau] 'cow', [mjau] 'name of a man', [də'ɾau] 'oatmeal'. But

it also occurs medially in ['nɒuʋɑ] 'a barber' (contemptuous), ['pɒuʋɑ] 'sandals'.

*Lahnda* [əu].

[əu], like [əo], occurs only in high-falling tone, e.g. [kəu] 'name of a tree', [səu] 'enduring', [b̃əu] (nasalized) 'much or many'.

The general characteristic features of the Lahnda vowel-system may now be noted :—

(1) The Lahnda front vowels are retracted vowels, none of them except [o], being on the 'line' of the cardinal figure.

(2) When stressed or accompanied with a high-falling tone, most of the Lahnda vowels are closer than otherwise, as in [pi] 'drink', [pī] 'grind' (cf. pp. 57, 58).

(3) When followed or preceded by stress the Lahnda vowels undergo violent 'reductions', the weaker varieties being substituted for the normal ones. Thus the neutral vowel [ə] is substituted sometimes for [ɑ] and sometimes for [ʌ] when they are pretonic (see pp. 59, 60), while [ʌ] often appears for [ɑ] in unstressed position as in [us<sup>(z)</sup>dʌ 'ghoɾɑ], 'his horse', [us<sup>(z)</sup>də 'ʃəkət] 'his child' but [us dɑ] 'his'. Similarly [i] is 'reduced' and sometimes entirely lost as in [zɪm'dɑɾ] (cf. p. 57). Even [ɛ] sounds like [e] in this position as in [ʃɛ'dʌi] (see p. 58).

(4) Lahnda has no final [ɪ] or [ʊ].

(5) A striking feature of Lahnda is the juxtaposition of many vowels in connected speech; the pitch of these 'juxtaposed' vowels becomes remarkably low at the end of a sentence, where there often occurs a peculiar sound somewhat like the 'voiced glottal stop' as in [o 'vɒdɛ 'vele sə'vele gɪ'rɒ̃ ã ɑɾɑ] 'he came to the village early in the morning'. The final vowels [ã ã ɑɾɑ] are pronounced with a low pitch accompanied by this peculiar sound.

[bir'balle 'Akbre ã 'akɦɑ] 'Bīrbal said to Akbar'.

[mẽ 'thakki pai ãiã] 'I was tired'.

(6) No such juxtaposition, which is due to peculiar grammatical forms, occurs in Hindustani or Panjabi, so far as the present writer is aware.

(7) The quantity of vowels in the pretonic position is distinctly shorter than normal (see pp. 52, 109).

(8) Many of the Lahnda vowels are nasalized, cf. pp. 89, 90.

(9) Lahnda is peculiarly rich in diphthongs, perhaps one of the richest languages in the world in this respect.

(10) These diphthongs are the incidents of flexion, and most of them occur only at the end of words. Some of them become dissyllabic in slow or emphatic speech.

but [mach] 'a large fish', [gucchi] 'mushroom' but [gochi] 'secret trade', though the last two words have no grammatical connection.

*Lahnda* [ɟ], [ɟh].

[ɟ] and [ɟh] are the voiced correspondents of [c] and [ch].

[ɟ] is a plosive, not an affricate like English [dʒ]. It does not explode before another [ɟ], as in ['bhaɟ ja] 'run away'. There is a slight explosion, however, before the front vowels, cf. ['raɟa] 'king' but ['raɟe] 'kings', ['saɟi] 'minstrels', ['ɟe devi di] 'hail to the goddess'. There is a distinct explosion before [d] where it sounds like [z], cf. [bhaɟ(z)da] 'running', [vaɟ(z)da] 'ringing', where the sound may be considered as a member of the phoneme [ɟ].

Like other plosives, [ɟ] is devoiced before plosives, cf. [bhaɟ̥jā] 'let us run away' but ['bhaɟ̥ paɾe] 'take your heels' (contemptuous), [aɟ] 'today' but [aɟ̥ θāɟ̥ɟ̥ e] 'it is cold today'.

[ɟh] has much greater explosion than the English [dʒ], e.g. [ɟhaɾ] 'reproach', [buɟhaɾət] 'riddle'.

Like other voiced aspirated consonants, it loses the aspiration at the end of a word, cf. [māɟjhā] 'she-buffaloes' but [māɟ] 'a she-buffalo', [buɟha] 'efface' but [būɟ] 'be effaced'. It similarly follows other rules regarding such consonants discussed above (cf. pp. 73, 74).

*Lahnda* [t], [th].

[t] and [th] have been often described as 'retroflex consonants', being those in which the tip of the tongue is curled back somewhere against the hard palate. But the fact has not yet been taken into account that the articulation of these consonants varies in different positions in connected speech, which may be described as follows:—

(1) In the present writer's pronunciation, whenever [t] is before a pause, just the edge of the tip is curled back against a point a little higher than the beginning of the slope of the hard palate, as in [saɪt] 'throw', [piɪt] 'beat the breasts', [ni'khuɪt] 'to be finished'.

(2) When [t] occurs before velars and palato-alveolars, and when it is doubled, the whole of the tip and perhaps a part of the blade as well is curled back against a point much further back, e.g. [paɪtkɑ] 'a turban', [maɪtkɑ] 'a jar', ['haɪtja] 'step aside', [khaɪtɕɑ] 'sour', [paɪtɕi] 'a writing-board'.

(3) When [t] occurs before labials and dentals, the tongue touches an area from the teeth-ridge to the beginning of the hard palate. Thus [t] before [p] in ['haɪt paɾe] 'get away!' is very nearly an alveolar, the curling being at the minimum. Similarly [t] before [d] as in ['haɪtɕɑ] 'getting aside' belongs

to the teeth-ridge area, but as the curling is even then maintained, it is a retroflex consonant.

[tʰ] maintains its occlusion in all positions, but the plosion of air is stronger before front vowels, which are sometimes partly devocalized, cf. [tʰik] 'correct', [mitʰhi] 'sweet', [tʰekɑ] 'a contract' but [tʰok] 'hit hard', [tʰɑr] 'coldness'.

For other rules regarding [tʰ], cf. the above remarks on the aspirated consonants.

### *Lahnda* [d], [dʰ].

[d] and [dʰ] are the voiced correspondents of [t] and [tʰ].

As in the case of other voiced plosives, [d] tends to be devocalized before a breathed plosive, cf. [ʼvɑɖɖɑ] 'elder' but [ʼvɑɖkɑ] 'an elderly man', [vɑɖ] 'cut' but [ʼvɑɖ te səi] 'just cut'.

When [d] occurs before [d], the glide from [d] to [d] is the nature of a flap and suggests [ɾ], cf. [ʼvɑɖ(ɾ)da] 'cut' but [vɑɖ] 'cut'.

### *Lahnda* [dʰ].

As in the case of all *voiced* aspirated consonants, there does not occur any appreciable explosion of air after [dʰ] before front vowels, cf. [dʰim] 'a clod' but [tʰik] 'correct', [dʰer] 'a heap' but [tʰekɑ] 'a contract'. It should be noted that the aspiration in [dʰ] is a voiced one, and so tends to be considerably reduced.

### *Lahnda* [k], [kh].

[k] and [kh] are velar consonants, and their tongue-position is about the same as that of the English velars. As regards the comparative aspiration after [k] and [kh], cf. p. 73 above.

There is some tendency in Lahnda to substitute [kh] for [k] of Persian and Arabic loan words, cf. [ʼkhursi] for [kursi] 'chair', [ʼmulakh] for [mulk] 'country'.

As pointed out above, [kh] before plosives tends to be pronounced somewhat like [x], cf. [ʼɑkh(x)ɑ] 'saying', [ʼlɪkh(x)ɑ] 'just write', [kh] before [kh] becomes [x], cf. [ʼlɪkh(x)-khɑ] 'just write', though other aspirated consonants lose the aspiration before a similar aspirated consonant, cf. [ʼpuch(c) chɔr] 'just ask', [ʼsɑtʰ(t) tʰeke] 'sixty contracts'.

Before front vowels the aspiration of [kh] is stronger before front than before back vowels, cf. [khê khɑ] 'eat ashes' (a term of abuse), [ʼkhird] 'cucumber', [kher] 'welfare' but [ʼkhali] 'empty', [ʼkholɑ] 'a building in ruins'.



*Lahnda* [g], [gh].

[g] and [gh] are the voiced correspondents of [k] and [kh].

As mentioned above, intervocalic [g] becomes [ɟ] when a word begins with certain aspirated consonants, e.g. [ʃhagɾa] 'a quarrel', [ʔbhagət] 'a devotee'.

Like other voiced plosives, [g] is devocalized before the breathed plosives, cf. [laɟke] 'having been attached', [laɟ te sɔi] 'just attach yourself', [laɟsi] 'it will be attached' but [ʔlaɟda] 'being attached', [ʔvaɟda] 'flowing', [ʔaɟ ʔdhê pai] 'the timber is fallen'.

Initial [gh] can precede a high-falling tone, cf. [ghâ] 'grass' but Panjabi [k'ɑ]. [gh] cannot end a word (cf. pp. 73, 74). cf. [lə'ghɑ] 'penetrate' but [lɑg] 'enter'. There is no difference as to its aspiration before front or back vowels, cf. [ghin] 'take', [gher] 'sinking sensation', [ʔghɔɾɑ] 'horse', [ghar] 'home', but [khit] 'heel', [ʔkheɾi] 'a kind of shoe', [khâ] 'eat'.

## THE LAHNDAL NASAL CONSONANTS.

[m].

The Lahnda [m] is a bilabial nasal consonant like English [m]. In the articulation of the principal member of the phoneme [m], the lips are slack, but a subsidiary member occurs before the high-falling tone, cf. [mī] 'rain' but [mil] 'a mile'. Here the lips are tense and [m] is more perceptible.

[n].

The Lahnda [n] is alveolar, the tip of the tongue touching the teeth-ridge.

The principal member of the phoneme [n] occurs in the beginning or at the end of words, as in [nak] 'nose', [kan] 'ear', [bân] 'a pond'. It is then alveolar and short. The tip of the tongue touches the middle of the teeth-ridge. Three secondary members of this phoneme occur:—

(1) Post-alveolar [n] occurs before velars and palato-alveolars, and before another [n], cf. [kan] 'ear' but [kan'kappa] 'one whose ear has been cut off', [ʔan'câɾiɑ] 'the moon is up', [ʔcanno] 'name of a woman'.

(2) Retroflex [n] occurs before retroflex consonants, and is short, e.g. [pɪɳɖ] 'village', [ʔkaɳɖɑ] 'thorn', [ʔmuɳɖɑ] 'cripple'.

(3) Dental [n] occurs before dental plosives, and is long, cf. [nal] 'with' but [dand] 'teeth', [ʔsante] 'a pious man' (oblique), [ʔsantha] 'lesson'. As regards the comparative length of [n] in (2) and (3) cf. [ʔdand] 'punishment' but [ʔdand] 'teeth', the former is short, the latter long.

## [ɲ]

The Lahnda [ɲ] is a palato-alveolar dental. It differs from the French [ɲ] as in [sɲe] = 'signer', because the latter is simply a palatal, being the nasal correspondent of the Slavonic [c], while in the case of the Lahnda [ɲ] a part of the tongue touches the teeth-ridge as well, and there is no [j]-like resonance after it as it is in the French [ɲ], cf. [pə'ɲebũ] 'anklets' with French [sɲe] = 'signer'.

[ɲ] cannot stand in the beginning of a word.

A subordinate member of the phoneme [ɲ] occurs when it is doubled, cf. [ʋəppũ] 'I may go' but [ʋəɲ] 'go', [ɲɲẽ] 'in this way' but [pə'ɲebũ] 'anklets'. In the articulation of this member there is a stronger muscular tension of the tongue, and there seems to be a slight post-resonance, but still not so prominent as in the French [ɲ].

## [ɸ]

The Lahnda [ɸ] is a flapped retroflex consonant, in which the tip of the tongue is curled back and after touching the hard palate immediately comes down with a flap against the back gums of the lower teeth.

It is different from Eastern Panjabi retroflex [ɳ], which is not a flapped consonant (as may be indicated by Kymograph tracings), e.g. [ʔkaɸa] 'one-eyed', [ʔraɸi] 'queen'.

[ɸ] before [l] and [n] becomes [n], cf. [calləɸ] 'to go' but [callən] 'lagga] 'began to go', [calləɸ] 'ditta] 'he let it go', but [callən nāi hōda] 'I cannot walk'.

## [ŋ]

The Lahnda [ŋ] is a velar nasal consonant, but its articulation is a little further back than the other velar plosives, and even when it is followed by another velar plosive, the present writer feels a forward movement of the tongue when it passes from [ŋ] to the plosive, as in [dʌŋgər] 'an ox', [lʌŋka] 'Ceylon', [bʌŋka] 'a dandy', [sʌŋkh] 'a conch'.

It often corresponds to [ŋg] or [ŋgh] of 'tatsama' Hindi words, cf. [sʌŋ kər ke] 'having associated with', Hindi [sʌŋg kər ke]. It is often doubled without any trace of [g], e.g. [ɟʌŋŋũ] 'legs', Hindi [ɟʌŋgh], Skr. [ɟʌŋgha- (=jaŋghā-)], [vʌŋŋũ] 'bracelets'.

## THE LAHNDĀ NASAL CONSONANTS.

We see, then, that Lahnda has as many as 7 nasal consonants, if the subordinate members of the phonemes be included. Of these, only [m] and [n] can stand in the beginning of a word; [ɲ], [ɸ] and [ŋ] can be only medial or final (historically, they are 'dependent sounds', being the products of assimilation of an

original [n] or [m] with a succeeding plosive), while [ɳ] and dental [ɳ] can stand only before certain consonants.

Both [ɳ] and [ɳ] can be doubled, and their contact and release stages in that case occur at slightly different points of the tongue.

### [l]

In the articulation of [l] the blade of the tongue touches the teeth-ridge, and, in the present writer's pronunciation, air passes from both the sides of the tongue. In the articulation of final [l] the back of the tongue is slightly raised, but not so much as in the English dark [l], so that acoustically it is still a 'clear' [l], cf. [ɡal] 'talk', but [lag] 'be attached'. ['lela] 'a lamb'.

[l] is devocalized after [th], cf. [cu'pɪthla] 'a kind of pearl' but ['patla] 'thin', [rakh ɛ] 'keep it'.

### [r]

[r] is a rolled consonant, generally accompanied by two rapid taps of the tongue against the teeth-ridge, cf. ['marla] 'name of a measure', ['marne] 'dying' (oblique). In the initial position, as in [ris (əris)] 'envy', it often tends to begin with a vocalic on-glide and sounds somewhat like [ər] (as kymographic tracings indicate).

Unlike certain dialects of Panjabi, [r] maintains the rolled resonance even before plosives, cf. [kardə] 'doing', [karke] 'having done', which in this position tends to sound like the fricative [r] in certain areas of the Punjab, as in Lahore. The number of taps and the rolled resonance increase after the high-falling tone, cf. [vāriə] 'O year!' but [vəriā] 'ornaments and costumes offered to a bride', [bār] 'outside' but [bar] 'a barren land'. This rolled resonance also varies with stress, cf. ['raɽe 'rōdiā 'rōdiā akhiə], 'the king said weeping'. Here the three [r]'s are pronounced with a successively decreasing rolled resonance varying with the prominence. Pretonic [r] loses considerably in resonance, and sounds like a fricative, cf. [sɪr] 'head', but [sɪɽ 'piɽ] 'headache'. It also loses its resonance before the voiceless fricatives [s] and [ʃ], cf. ['karsi] 'he will do', ['kher sələ], 'all right', ['kar ʃarəɪm] 'have some shame'.

It is devocalized after [th] (cf. above, under [l]) as in [methɽi] 'a kind of vegetable green'.

### [ɽ]

[ɽ] is the non-nasal correspondent of [ɽ̃] described above. It cannot stand in the beginning of a word, e.g. ['kaɽə] 'a bracelet', ['pāɽ] 'read', ['peɽə] 'a kind of sweet-meat'.

[ɾ] occurs in consonant-groups the first member of which may be a plosive, cf. [kɾâ] 'a kind of pudding', [pɾâ] 'a stage on a journey', [dɾunne] 'sour pomegranates', [bɾi] 'name of a village', [tɾagi] 'a waist-band', [sɾâd] 'stink', [ɟɾau] 'a kind of pearl'.

It may again be pointed out that [ɾ], like [ɸ], is not a mere retroflex consonant, it is a retroflex *flapped* consonant. It is the rapidly moving flap which gives the sound its characteristic resonance.

### THE LAHNDA FRICATIVE CONSONANTS.

#### [f]

[f] is a labio-dental fricative occurring in a few Persian or Arabic loan-words, as in ['kɸaɸki] 'anxiety', [ɸef] 'a blanket', [ɸɸaɸ ho] 'get away', but it is not a regular sound in Lahnda. As regards the change of [ph] into [ɸ] as in [ɸɸɸ(ɸ)te nâi] 'you have no spleen?', see p. 73.

#### [s], [z]

In the articulation of the Lahnda [s] the tip of the tongue touches the middle of the lower teeth and the lips are generally slack, as in [sɔk] 'relation', [sɪr] 'head'. But when [s] is doubled, the lips are tenser and the sound more perceptible, as in ['missɔ] 'a lentil-cake', ['dhussɔ] 'a blanket', ['kɸassi] 'castrated', ['lassi] 'whey', ['phissi] 'a serpent'.

Before [d], s is vocalized, e.g. [us(z)da ɟakət] 'his child', [us(z)ɸittɔ] 'he gave', but cf. [us gã ã marɪɔ] 'he struck the cow', [us ɟaŋgər ãɟɔ] 'he brought the bullock', where the vocalization does not occur.

[z] is the voiced correspondent of [s], but it rarely occurs in Lahnda, except in a few loan-words from Persian and Arabic, as in ['maza] 'enjoyment', ['hezɔ] 'cholera', and even in such words it is more often pronounced as [ɟ] among the Hindus, though Muslims, even the illiterate, use [z].

#### [ʃ]

In the articulation of [ʃ] the tip of the tongue touches the lower teeth; there is no lip-rounding, as it is often in English, the stream of breath is also less copious than with the English variety, cf. [ʃer] 'a lion', [ʃi'kar] 'hunting' but under stress or tone the breath-stream becomes quite copious, cf. [pət'ʃâ] 'a king', [ʃastər] 'a Shāstra—Hindu code of laws', [pər'ʃad] 'gift'. But [ʃ] is of rare occurrence in Lahnda, being restricted to Persian, Arabic and Sanskrit loan-words.

## [x] and [g]

The fricative [x] is a velar consonant, but it is a little more front than the velar plosives, cf. ['xala] 'aunt' but ['kala] 'black', [bu'xar] 'fever' but [pu'kar] 'a call'. Similarly ['likh(x)ke] 'having written'.

[x], like [f], is found only in a few Persian and Arabic loan-words, and is not a regular sound in Lahnda, except when [kh] becomes [x] before a plosive (cf. p. 77).

In the present writer's pronunciation, [x] is a weak fricative, the stream of breath being almost inaudible before a plosive, e.g. ['puxta] 'firm', ['taxte] 'boards', ['likh(x)ke] 'having written'.

[g] is the voiced correspondent of [x], and like it rarely occurs in Lahnda, e.g. ['dağa] 'deceit', [bağ] 'a garden', [dağ] 'a spot', though the Hindus more often pronounce ['dağa], [bağ], [dâg]. Like [x], [g] is only a weak fricative, especially before plosives, e.g. [bağ 'ban] 'a gardener', ['dâg de gɛ] 'he has given a blow (of grief)'.

Though [g] in all positions is a rare sound in Lahnda, mention has already been made of the regular sound [g] appearing as a subsidiary member of the phoneme [g] in words like ['bhagaɽ], ['jhaɽa], etc. (see p. 78).

## [h]

The Lahnda [h] is a voiced glottal fricative both initially and medially, cf. ['hosi] 'it will be', ['hârdəl] 'turmeric', [pə'hər] 'a mountain', [lə'həɽ] 'Lahore'.

The present writer feels a considerable rise of the larynx when [h] occurs in a stressed or toned syllable, cf. ['hâja] 'alas!' (in lamentations only) but [hæ] 'alas!', [hâr] 'the month of Hâr' but [həri 'mal] 'name of a man born in the month of Hâr', [hê] 'this' but [herni] 'a kind of play among boys', [sə'heɽən] 'to court evil'.

When [h] is initial, the second syllable, if stressed, tends to get the 'lower rising-falling' tone, cf. [hə'nera] 'darkness', [hu'nala] 'summer', [hə'kimā] 'doctors' (oblique) but cf. [sara gi'rā həkimā da] 'a whole village of doctors', where [ki] has no stress.

## [ʔ]

Besides the above fricatives, the voiced glottal fricative (described on p. 72) often occurs as a result of the juxtaposition of several vowels peculiar to Lahnda.

Besides the above, the voiceless glottal stop sometimes occurs between a toned and a toneless vowel, e.g.

[gaɽ te 'ê'e] 'the fact is this'.

[us da 'vjâ'a] 'it was the occasion of his marriage'.

[o mə'lâ'ia] 'he had been a sailor'.

[o te mēɽe joɽ 'phûi'ei] 'that was gallows for me'.

## THE LAHNDĀ SEMI-VOWELS.

The Lahnda [v] is a semi-vowel in the sense that it is a glide to another vowel, being never followed by another consonant and having very little occlusion or contact. In the articulation of [v] just the edge of the upper teeth very gently touches the inner side of the lower lip at a point nearly opposite to the gums of the lower teeth. There is absolutely no explosion of breath as with the English [v].

Occlusion becomes a little appreciable when [v] is followed by the high-falling tone, cf. [vâdā] 'an increase' but [və'dh~ɑ] 'to increase' (transitive). [v] before this tone may be taken as a subsidiary member of the phoneme [v]; the point of the lower lip, which the upper teeth touch in the articulation of this subsidiary member, is somewhat higher.

When [v] is intervocalic and occurs in an unstressed syllable, the lower lip rises and touches the upper teeth, which are then comparatively passive, while the acoustive effect is also different from that of the normal initial [v]. The [v] in this case sounds least consonant-like, so that it may be considered as a second subsidiary member of the phoneme [v], e.g. [ˈsəvə cɑr] 'four and a quarter', [ˈrɑvɑ] 'a scarf'. This 'reduction' of [v] becomes all the more striking when it is preceded by [u], e.g. [suvɑri] 'a vehicle', [kuvɑri] 'a virgin'. And yet the sound here is not a mere intervocalic glide, because the lower lip is fairly active against the upper teeth.

## [j]

[j] as a semi-vowel is not a frequent sound in Lahnda. There are very few, if any, genuine Lahnda words with an initial [j]. The present writer knows only a few, viz. [ˈjakkəʃ] 'camouflage', [ˈjakkɑ] 'a kind of carriage' (Hindi [ekka]), [ˈjārā] 'eleven'. Perhaps even these are loan-words. A few Arabic and Persian loan-words also occur as [ˈjɑr] 'friend', [ˈjɑd] 'memory'.

When it is intervocalic it is difficult to determine whether it should be placed in the list of consonants or vowels, because very little occlusion then occurs. Thus the [j] in [ˈhojɑ] 'became', [ˈmojɑ] 'dead', [ˈrojɑ] 'wept', [ˈɑjɑ] 'came' (commonly written with j) should be rather transcribed as [ɪ].

## PLOSION.

The Lahnda consonants behave in two different ways:—

(1) At the end of a word, before a pause, they do not explode, cf. [sɑp] 'a serpent', [sɑt] 'seven', [sɑc] 'truth', [sɑtʰ] 'throw', [sɑk] 'a chip of wood'.

The only exception is breathed aspirated consonants (cf. p. 73) as [lɪpʰ] 'the spleen', [hɑtʰ] 'hand', [mɑtʰ] 'a large

fish', [sāth] 'sixty', [likh] 'write'. Here explosion does take place (as kymograph tracings have also shown).

(2) Before another consonant, they explode, whether they are in the interior or at the end of a word, cf. [chapda] 'hiding' but [chap] 'hide thyself', ['cup kar] 'be quiet' (authoritative) but [cup] 'hush!'. Similarly explosion occurs in ['jatka] 'O boy!', ['matka] 'a jar', ['satke] 'having thrown', ['hakda] 'talking nonsense', ['apri] 'one's own', ['admi] 'a man', ['sāmfe] 'in front of'. In this respect Lahnda differs from Hindi, in which there is no such explosion.

It may be noted in this connection that Lahnda has no consonant-groups at the end of words, cf. ['vakot] 'time', literary Hindustani [vaqt], ['garəm] 'hot', literary Hindustani [garm]. This absence of final consonant-groups seems to be partly due to the above-mentioned tendency.

But plosion is not so appreciable when the final consonant of a word is preceded or followed by stress, cf. ['pare haṭ ke rəo] 'keep aside at a distance' but ['haṭ pare] 'get aside'. In the former case there is no (or very slight) explosion of [t] before [k], in the latter the [t] does explode. In [phuṭ'kar] 'a curse' the [t] does not explode, as it is in the interior of the word, and is pretonic. Again cf. ['vat kita] '(he) did it again' but [vat 'kikəṭ hoi] 'then how did it occur?', [t] before [k] in the former sentence explodes, in the latter it does not.

In this connection the following sentences may be of interest :—

(a) [paṭke 'saṭ ditte] '(they) threw down their turbans'. Both [t]'s explode; the former is in the interior of a word, the latter at the end.

(b) [paṭ ke saṭ ditte] '(they) dug it out and threw it'. The first [t] explodes (though not so much as in the [t] of ['paṭke] 'turban'), while the second [t] does not.

[paṭ ke 'saṭ ditte] 'they dug it out and *threw* it'. The second [t] explodes, the first does not.

Plosion also does not occur in the following cases :—

(1) [b] before [m], cf. ['dub mar] 'be drowned' (a curse) but ['katnē] 'do you spin?', ['vat nāi loṭa] 'you have not to come again', ['vatṭa] 'a kind of cosmetics'.

(2) A dental before alveolo-palatal, e.g. in ['sat 'eər jārā] 'seven and four make eleven', ['vat ca ḡm] 'take it again', ['lad ja] 'come and load'. But cf. ['lakk ḡa] 'the dog) has licked' where [k] slightly explodes before [g].

#### ASSIMILATION.

Assimilation has been copiously dealt with under the various consonant-phonemes. Here its general features may be outlined :—

Assimilation is generally regressive. A voiced consonant followed by a breathed one is devocalized, though not vice versa, cf. ['dab̥si] 'he will bury', ['sadb̥si] 'he will call', ['laq̥ ke] 'being attached' but ['kap̥ gɪd] 'he has cut it', [sat̥ ghore] 'seven horses'.

The devocalization is a little greater when the voiced consonant is in the interior of a word than when it is final, cf. [kag̥tā] 'papers' (oblique of ['kag̥et] 'paper') but ['laq̥ te səi] 'just attach yourself', ['dab̥sā] 'I shall bury' but ['dab̥ sājā] 'bury it, O Lord'.

Assimilation is progressive in the following:—

(1) A preceding [th] devocalizes [r] or [l], e.g. in [cup̥ith̥la] 'name of a pearl', [meth̥ri] 'name of certain vegetable greens'.

(2) An original [ŋg] or [ŋgh] becomes [ŋ] at the end of a word, cf. [saŋ] 'association' but ['saŋgi] 'a companion', ['jāŋ] 'leg', Skr. [jaŋgha-].

#### DISSIMILATION.

Dissimilation occurs in the following cases:—

(1) [f̥] before [l] or [n] becomes [n], cf. [call̥f̥] 'to walk' but ['call̥ən 'lag̥d̥] 'he began to walk' (cf. p. 79), [call̥ən n̥i hōd̥] 'I cannot walk'.

(2) [r] after the [r] of another syllable becomes [r̥] in the Arabic (or Persian?) loan-word: [mæg̥'rur̥i] 'pride', otherwise cf. [sar̥ir] 'body'.

(3) [f̥] after [r] or [r̥] (of the preceding syllable) becomes [n] cf. ['chapp̥f̥] 'to hide' but ['pḁ̄r̥ən] 'to read', ['kar̥ən] 'to do'.

(4) [n] becomes [l] before [l] of another syllable in a Hindustani loan-word ultimately from the Portuguese [leilaō]: [l̥i'lam] 'auction', from Hindustani [nilam]; otherwise cf. [nil̥a] 'blue'.

#### DOUBLE CONSONANTS.

From the organic, as opposed to acoustic, point of view, a double consonant is a long consonant, in the articulation of which the interval of silence between the stop-stage and the off-glide stage of a consonant takes considerably more than usual time. But as the acoustic effect among many hearers (including the present writer) is of two consonants, we may call the consonant a double consonant. Moreover, such double consonants are often significant in Lahnda, cf.

['sāt̥ər] 'a line' but ['satt̥ər] 'seventy'.

['pat̥a] 'information' but ['patt̥a] 'a playing card'.

['rat̥e] 'a little' but ['ratt̥e] 'blood' (oblique).

['sat̥i] 'a devoted wife' but ['satt̥i] 'the seventh' (in playing cards).

['mun̥i] 'a sage' but ['mun̥ni] 'a little girl'.



Double consonants in Lahnda occur under the following conditions :—

(1) Double consonants inherited from Prakrit, cf. ['sacca] 'true', ['vaccha] 'a calf', ['sukka] 'dry', ['habba] 'all'.

(2) A final consonant at the end of a monosyllabic word is always doubled when the initial vowel of another word follows: cf. [hik] 'one' but ['hikk a] 'there had been one', ['jat] 'a peasant' but ['jatt a] 'there was a peasant'. When, however, the word is *polysyllabic*, the final consonant is not doubled, though it goes with the succeeding syllable. cf. ['vakət ɪa] 'there was time', ['garəm ɔlu] 'hot potatoes'. Even in this case, however, the consonant becomes longer.

(3) Monosyllabic words also double their final consonant if they are enlarged by a suffixal vowel. cf. [jat] 'a peasant' but ['jatte] 'to a peasant', [lat] 'leg' but ['latte] 'to the leg', [phu] 'a breach' but ['phuṭṭi] 'broken or divided' (feminine), [cup] 'quiet' but ['cuppu] 'reserved' (contemptuous), [rab] 'God' but ['rabba] 'O God!', [sath] 'sixty' but ['satthe] 'sixty only', [hik] 'one' but ['hikka] 'only one', [vap] 'go' but ['vapṇe] 'let him go'.

But if the word is polysyllabic, the doubling does not occur before the suffixal vowel. cf. ['vakət] 'time', [vakte] 'to the time'; ['karəd] 'knife', [kər'de] 'to the knife', ['garəm] 'hot' but [germi] 'heat', [lə'həor] 'Lahore', [lə'həore] 'to Lahore'.

(4) A final consonant is pronounced long when the word is stressed, though acoustically it does not give the impression of two consonants to the present writer. cf. ['hatť̪ pare] 'get away', ['dass khā] 'pray tell me', [dalic luṭ̪̌ 'ghatť̪] 'put some salt in the lentils'. On the other hand, consonants pronounced double when the word is isolated, may become single if the word is unstressed and preceded or followed by stress (cf. p. 95) as in [utte] 'upstairs', [ute cə'bare te a ja] 'come upstairs on the garret'.

(5) As regards consonant-groups, there is no doubling of a plosive before another plosive, e.g. ['vakte] 'to the time', ['sakda] 'he can', ['jatka] 'O boy!', ['maṅgda] 'asking', ['chāṇka] (hanging) nails', but a plosive before [r] and [j] is doubled, provided that the word is stressed, e.g. ['khattri] 'a Khatri', [puttre] 'to the son', ['likkhja] 'written', ['chakkja] 'swallowed', ['chappja] 'hidden', ['sattja] 'annoyed'.

The *general characteristic features of the Lahnda consonant-system* may now be described :—

- (1) Lahnda consonants become often considerably perceptible before or after the high-falling tone (see p. 73).
- (2) There are two series of significant aspirated consonants (see p. 73).

- (3) No consonant-group exists at the end of words (see p. 84).
- (4) The 'retroflexion' of the retroflex consonants varies, under different conditions, from nearly dental to purely retroflex position (see pp. 76, 77).
- (5) The [c] and [j] (with their aspirates) of Lahnda are *plosives*, not *affricates* (see pp. 75, 76).
- (6) Lahnda has as many as 7 nasal consonants (see p. 79).
- (7) Lahnda has no voiced aspirated consonants at the end of words (see p. 73).
- (8) Some of the aspirated consonants when initial tend to impart a rising tone to a succeeding stressed syllable and to make the intervocalic [d] and [g] sound like [ḍ] and [ḡ] (see p. 75).
- (9) [ʃ] and initial [j] are rare in Lahnda (pp. 81, 83).
- (10) Lahnda has two flapped consonants [ɾ] and [ɽ] (pp. 79, 80).
- (11) Aspirated plosives tend to become fricatives before plosives (pp. 73, 75).
- (12) Plosion of a consonant before another occurs medially, but not finally.
- (13) The final consonant of a monosyllabic word is doubled when a vowel follows.

#### NASALIZATION.

Nasalization may be considered under three heads:—

1. Dependent nasalization.
2. Independent nasalization.
3. Syntactical nasalization.

1. Dependent nasalization means the nasalization of a vowel due to a preceding or succeeding nasal consonant either actually present *in the same word* or dropped owing to historical reasons.

2. Independent nasalization means the nasalization of a vowel without the contiguity of any nasal consonant in the same or a neighbouring word.

3. Syntactical nasalization is the effect of a nasal sound, whether a vowel or a consonant, present in *another* neighbouring word in the same sentence.

(1) Dependent nasalization in Lahnda occurs either

- (a) medially, or
- (b) finally.

(a) Medial dependent nasalization occurs in the *interior* of a word, when a vowel is *followed*, but not if only preceded, by a nasal consonant in the same syllable; in other words, medial dependent nasalization is always regressive. Thus we have—

[rām] 'name of a man', but [mar] 'kill'.

[ʃãṃã] 'a gown', but [mɑʃũ] 'name of a fruit'.

[kãṇ] 'ear', but [nɑk] 'nose'.

[rãṇ] 'woman', but [nɑr] 'male'.

[niãṛi] 'a barber's wife', but [nɑiɟɑ] 'O barber!'

This regressive nasalization is so important a condition that when the following nasal consonant belongs to another stressed syllable, the nasalization does not occur—cf. [ʃãṛã] 'man', but [ʃə'nãni] 'woman'. Here [ə] is not nasalized, as the succeeding [n] belongs to another stressed syllable.

[ʃãṛe di] 'of a man', but [ʃəṛṛedi] 'giving birth to'.

Here [ə] is not nasalized owing to the same reason.

(b) At the end of a word, however, a vowel when preceded immediately by a nasal consonant is nearly always nasalized, so that final dependent nasalization is progressive, cf.—

[rãmã] 'name of a man', but [mar] 'kill'.

[ʃãmã] 'a gown', but [mɑʃũ] 'name of a fruit'.

[sõnã] 'gold', but [nas] 'nostril'.

[cĩnĩ] 'a Chinese', but [nic] 'degraded'.

[pheṛi] 'name of a pudding', but [nephɑ] 'hem of a garment'.

Hence a nasal consonant in the beginning of a polysyllabic word does not nasalize the succeeding vowel.

The following, then, are typical examples of both medial and final nasalization in Lahnda :—

[pãṛi] 'water', [kãṛi] 'one-eyed'.

[dãṛũ] 'seed', [cĩṛũ] 'a kind of grain'.

In his transcriptions of Lahnda words, however, the present writer has not transcribed medial and final *dependent* nasalization (except to avoid grammatical ambiguity), with the understanding that both these types of nasalization always occur under the above-mentioned conditions.

In connection with medial dependent nasalization a peculiarity of Lahnda may be noticed. After a high-falling tone accompanying a close vowel, an original medial nasal is entirely driven out, thus Lahnda, like Panjabi, has [khãṇḍ] 'sugar', [pĩṇḍ] 'village', [dãṇḍ] 'tooth', [bĩṇḍɑ] 'a low stool', but unlike Panjabi, Lahnda has [gãḍ] 'bundle', Panjabi [gãṇḍ], [sõḍ] 'ginger', Panjabi [sũṇḍ]. But after an open vowel this loss does not occur, cf. [mêḍɑ] 'my', [têḍɑ] 'thy', [pãḍɑ] 'a priest'. The reason of this difference is obscure; but this indicates that it is the consonantal element which the high-falling tone has driven out; for the consonantal element does not occur after open vowels.

Lahnda medial nasalization of a close or half-close vowel is always followed by a (nasal) consonantal element, which can

often be historically traced to an ancient or middle Indian [n] or [m], cf. [dāṇḍ] 'tooth', Hindi [dāt]; [bhāṅg] 'hemp', Hindi [bhāṅg]; [rāṇḍi] 'a widow', Hindi [rār]. Similarly in the case of the present participles like ['hōṇḍa] 'being', ['rōṇḍa] 'weeping', [mārēṇḍa] 'beating', ['dēṇḍa] 'giving'. But the consonantal element does not occur after the open vowels [ε] and [a], cf. ['cēḍa] 'raising', ['khēḍa] 'eating', ['dād] 'a bullock', ['kūḅ] 'a flood', ['rāḅla] 'coloured', ['bāka] 'a dandy', ['prāḍi] 'women's hair-ribbon'.

(c) It has been pointed out above that a final vowel preceded by a nasal consonant is nearly always nasalized. But there are a few words which present some difficulty. Thus for 'mother' Kēhuḍi has [mā] but not [mā̃], which Panjabi and some Lahnda dialects have. Again, we have [nai] 'a barber' but [nāi] 'not, no'. [nai] historically goes back to Sanskrit [nāpita-], and the [a] accordingly may not have been felt as a final. [nāi] seems to be either a contraction of [nā hi], where the final [ə] of [nə] 'no, not' seems to have preserved its nasality, or may be traced back to Skr. [nāsti].

There are several final nasal vowels, the nasal element of which historically or analogically goes back to terminational [m] or [n], cf. ['hatthi] 'by the hand of', ['kaḍi] 'ever', ['kaḍi] 'kutti' 'to crows and dogs', ['viccō] 'from the interior', ['uttō] 'from above', [Asi] 'we', [tusī] 'you', though as regards the last two words the nasal element does not generally occur in the present writer's pronunciation. Thus we say [Asi] 'vesā' 'we shall go' but [Asi vī] 'we also', when [vī] 'also' is not followed by any other word.

But while the final nasal of *polysyllabic* words of this class is often dropped, dependent final nasalization is not omitted when the word is a monosyllable, thus the present writer always says [tū] 'thou', Hindi [tu], Skr. [tvam]; [lī] 'lion', Skr. [simha-]; [dhū] 'smoke', Hindi [dhū], Skr. [dhūma-]; [lū] 'hair on the body', Skr. [loma-].

(2) Independent nasalization generally occurs only in the final position under the following conditions:—

(a) At the end of certain monosyllabic particles as [yā] 'or', Hindustani [ya]; [tā] 'then', Hindustani [tab], Panjabi [tadō]; [ā] 'to'. There is a tendency among Lahnda speakers to nasalize Hindi monosyllabic finals in the course of reading, thus [se] 'with or from' is often pronounced [sē], [te] 'on or from' as [tē], and this tendency is predominant among Sādhu preachers who in their formal discourses or readings nasalize monosyllabic finals, and their general style of discourse somewhat resembles the Welsh *hwyl*.

(b) Many monosyllabic finals are nasalized, the nasalization in several cases being either, in some cases analogical or in some cases compensatory, owing to the historical loss of certain

sounds or elements of sounds, cf. [gũ] 'foecus', Skr. [gũtha-], Marathi [gu]; [bhũ] 'straw or chaff', Hindi ['bhusa], Panjabi [bho]; [rũ] 'cotton', Hindi [rui]; [bi] 'seed', Hindi [bi]; [bũ] 'arm', Skr. [bāhu-]; [chũ] 'shade', Skr. [chāyā-], Hindi ['chāō]; [gũ] 'cow', Hindi [gae] or [gau].

(c) Among polysyllables, the usual nasalization is of the final [a] of numerals and of feminine words. For numerals 11-19 Lahnda nasalizes the finals, as ['jārā], ['bārā], etc. while Hindi has ['gjarā], ['barā], etc. Most of the other numerals, however, do not have this nasalization, cf. ['cāli] 'forty', ['assi] 'eighty', ['nāvve] 'ninety', though nasalization occurs in the finals of words for 89, 91-99, cf. ['kanvē] 'ninety-one', ['banvē] 'ninety-two' but cf. ['nasī] 'seventy-nine', ['tāli] 'thirty-nine', where the final is not nasalized. Nor is the toned [ā] nasalized, cf. ['dā] 'ten', [pən'jā] 'fifty'.

As regards feminine words, the final [a] is nasalized, but not other vowels. For instance, a man named [sita 'ram] is often familiarly addressed and spoken of as ['sitā], but a woman [sita 'devi] is addressed and spoken of as [sitā]. Similarly the male ['tarā], but the female ['tarā]. Other vowels, however, are not nasalized, cf. [par'batti], Skr. [pārvatī], familiarly called [batti] and not [battī]; [dhropti] (Skr. [draupadī]) and not [dhroptī]. The nasalizations (b) and (c) do not occur in Hindi, so far as the present writer is aware.

### *Medial Independent Nasalization.*

While Lahnda has gone much ahead of Hindi and even of Panjabi in the nasalization of finals, quite the reverse is the case with its medial vowels. It is almost absent in Lahnda. It has been already pointed out how medial nasality has been entirely driven out after the high-falling tone (except for open vowels) in Lahnda (cf. p. 88). Thus while Hindi has [ākḥ] 'eye', [sāc] 'truth', [pāchi] = [pāchi] 'bird', [kāc] 'glass', Lahnda has [akh], [sac], [pākheru], [kac]. There exist only a few loan-words from Hindi or Sanskrit proper names like [kāfi], H. [kaṣi] 'Kāshī', [bāfi], H. [baṣi] 'name of a man' indicating such nasalization.

### *Vowels that may be nasalized.*

Of the plain vowels, all can be nasalized under the conditions described above, as [a] and [i] in ['pāfi] 'water'; [e] in [mā'rēda] 'beating', [ē] in [nēn] 'eye', [tē] 'by thee', [sē] 'sleep'; [o] in [rōda] 'weeping', [u] in [jū] 'lice', etc.

Of the diphthongs, the following 16 can be nasalized :—

[ēi], as in [dēi] 'give please'.

[āi], e.g. [āi] 'please come'.

[āi], e.g. [lāi] 'take'.

[ōi], e.g. [dōi] 'curd', [bōi] 'sit'.

- [õi], e.g. [dhõi] 'wash'.  
 [ãe], e.g. [hɛɲ nə khãe] 'do not eat in this way'.  
 [ĩã], e.g. [diã] 'to-morrow'.  
 [õa], e.g. [dõa] 'both'.  
 [ũa], e.g. [dũa] 'of both'.  
 [iõ], e.g. [diõ] 'day time'.  
 [aõ], e.g. [pɑõ] 'a trick in dice'.  
 [ʌõ], e.g. [jʌõ] 'barley'.  
 [əu], e.g. [nəu] 'the nails'.  
 [iẽ], e.g. [giẽ] 'have you gone?', [piẽ] 'have you fallen?', [riẽ] 'have you lived?'.  
 [iã], e.g. ['mali<sup>(i)</sup>ã] 'to the gardeners', ['kaliã] 'to the black ones' [us diã] 'his'.  
 [iã], e.g. ['kapiã] 'by cutting', ['miliã 'bhıtiã] 'by meeting and greeting'.

The last three of the above diphthongs nasalize only their second element.

(3) Syntactical nasalization occurs in connected speech, when the vowel of an unstressed word is nasalized by the proximity of another word ending in a nasal vowel, cf.

[tũ vi] 'thou also' but [ô vi] 'he also', [sara girã i] 'even the whole village' but [sara i] 'even the whole'.

The [i]'s in both these sentences have been nasalized only when preceded by the nasal in the preceding word.

Sometimes a plosive occurring in a word and followed and preceded by nasal consonants in different words sounds like a nasal consonant:—

[e kɪɲpɛ b(m)ʌɸdi e] 'how is it done?' Here [b] sounds somewhat like [m].

[e kɪkəɸ g(ŋ)ɪɸde o] 'how do you count this?' Here [g] sounds somewhat like [ŋ].

When a nasal sound is followed by stress, it is likely to be reduced or lost, cf. [tũ vi] 'thou also' but [tu i the 'kiõ 'bethẽ] 'why are you sitting here?' The final of [tũ] loses its nasality. ['chã 'takkɔ] 'look at the shade!' but [chã 'dãdi tħãdi e] 'the shade is very cool'. The nasality of [chã] is considerably reduced in the second sentence.

#### INTONATION.

Before we enter into intonation proper, i.e. the sentence-intonation of Lahnda, it will be necessary to study the general features of *word-prominence* in Lahnda.

If we take some of the common literary Hindustani monosyllabic words ending in consonant-groups, such as ['vɑqt] 'time', ['saxt] 'severe', ['garm] 'hot', ['sard] 'cold', etc., we find the tune of these words as —. In Lahnda the same

words are pronounced with two syllables each with a low prominence, as [vakət], [sakhət], [garəm], [sarəd], etc., the scheme of intonation being —•.

As regards words of three syllables, a comparison with Hindustani will again be instructive. Take the Hindustani words [s.ʌo'dəgər] 'merchant', [ba'zəri] 'belonging to the market, i.e. not home-made', [be'cərə] 'poor'. These words have a primary stress on the second syllable, and a secondary stress on the initial syllable, so that the rhythm of these words may be represented as

— — •      — — •      — — •  
[s.ʌo 'da gər,    ba 'za ri,    be 'ca ra].

In Lahnda, however, the secondary stress does not appear: both the initial and the final syllables are pronounced with a weak prominence, as the reduced quality of the initial vowels indicates; while the second syllable here is the prominent syllable, being the only stressed one. Thus the above words in Lahnda are pronounced as

• — •      • — •      • — •  
[su 'da gər,    bæ 'ja ri,    vi 'ca ra].

They indicate a comparatively monotone intonation with stress on one of the syllables.

A similar scheme may be noticed in Lahnda compound words, the second or the last member of which is nearly always stressed, all the other syllables becoming monotone—a feature which distinguishes Lahnda from Panjabi (cf. pp. 52-54). Thus the rhythm of [rəda 'kɪʃən] 'name of a man', [sɪta 'ram] 'name of a man' may be represented in Lahnda as

• • — •      • • —  
[ra da kɪʃ ən]    [si ta ram].

while in Panjabi the tune is

— — — •      — — •  
[râ ,da kɪʃən]    [sɪ 'ta ram],

where we have two prominent syllables.

In the Lahnda examples above, we find that the only prominent syllable is [kɪʃ] in the first example, and [ram] in the second. Thus the 'nucleus' may not be necessarily the middle of a sound-group. That this prominence here is not mere pitch, but is combined either with breath-force or quantity or both, is indicated by the striking reduction of the vowels in the first member of the compound; thus the vowels of [sɪta] in the second example are reduced considerably in pitch, quantity and quality. For further examples cf. pp. 52-54. Not only the perceptibility of pretonic vowels, but also of consonants, is affected, cf. [sɪr] 'head', in which [r] is clearly articulated

as it is in [ʼsɪr pɪɑ] ' (he) fell on (his) head ', but in the compound word [sɪr 'pɪr] 'headache' the perceptibility of [r] is considerably lost. Similarly cf. [p] in [ʼsɑp ɡɪɑ] 'the serpent is gone' with the [p] in [səp 'kʊɲɲ] 'the slough of a serpent', the [p] in the latter example being considerably obscured.

But there are complications. There arises the question of the tones, which seems to disturb the scheme of rhythm mentioned above. A short description of these tones will therefore be necessary.

(1) The high-falling tone is a significant tone, as in Panjabi. It sounds like the tone in English 'yes'<sup>1</sup> meaning 'of course it is so' and may be represented as ˥. There is a considerable number of Lahnda words with different meanings when toneless and when accompanied by tone as [vɑɖɖɪ] 'large' but [vɑɖɖɪ] 'a bribe', [pɑ] 'put' but [pɑ̃] 'manure', [dɑ] 'of' but [dɑ̃] 'ten', [pɪ] 'drink' but [pɪ̃] 'grind'. But a very large majority of the 'toned' words have no toneless correspondents, while these toned words as a general rule can be traced to an original intervocalic [h] which 'amalgamated' with the vowel, e.g. [dɑ̃] 'ten' goes back to \*[daha-] < Skr. [daśa-].

In the articulation of this tone the present writer feels an abrupt fall of the larynx.

(2) The low-rising tone is not a significant tone in the present writer's dialect, and thus differs from a similar tone in Panjabi and Himalayan Lahnda. It seems to accompany initial voiced aspirated plosives, e.g. in [ghoɾɑ] 'horse' the [o] seems to rise in tone and is not heard as a toneless [o] as it is in [hor] 'another' and [goɾɑ] 'white'. But even then it does not devoice these plosives, nor does it affect the meanings of words. Moreover, the voiced aspirated consonant in my dialect may, in emphatic speech, be accompanied by the *high-falling* tone, as [bh̃ɑ̃ɟɑ] 'O brother!', [bh̃ɑ̃bi] 'O brother's wife'. In Panjabi these words are always pronounced [p'ɑ̃ɟɑ], [p'ɑ̃bi].

In the articulation of this kind of low-rising tone which is confined to voiced aspirated consonants, and which may be called 'upper low-rising tone', the present writer feels first a gradual fall and then rise of the larynx.

But there is another variety of low-rising tone which is significant and which may be traced to an original [h] in some cases, e.g. [rɑ] 'a royal personage' but [r̃ɑ] 'rhythm' (Old Hindi [raha]), [kɑ̃fi] 'one-eyed woman' but [k̃ɑ̃fi] 'a mud-heap'. It also occurs as a correspondent of high-falling tone when followed by a more prominent syllable, as [ɑ̃n] 'they', but [uñɑ̃nda] 'theirs', [pɑ̃r] 'read' but [pr̃ɑ̃i] 'teaching', [bɑ̃n] 'bind' but [bnɑ̃i] 'charges for binding', [vɑ̃d] 'grow, prosper' but [v(ə)d̃ɑ̃i] 'congratulations', [sɑ̃oɾɑ] 'father-in-law', but

<sup>1</sup> Daniel Jones: An Outline of English Phonetics, 2nd Edition, p. 137.



[sur<sup>~</sup>ej] 'a relation of father-in-law'. The quantity of the vowel with this tone is distinctly longer than in the case of the other two tones.

In the articulation of this tone, which may be called 'lower rising-falling tone'. I feel a much greater fall and then rise of the larynx. It should not be confused with [h], for in the articulation of [h] I feel a little fall of the larynx, but no rise at all, while in the tone in question the fall is much greater while the rise is very considerable.

We shall now consider the complications raised by these tones in the scheme before us. It has been pointed out above that the tune of common Lahnda dissyllabic words like [kapra] 'cloth', [soṭi] 'a stick', [raja] 'a king', the rhythm is  $\text{—} \cdot \cdot$ . But words like [kôṛa] 'leper', [dôṛa] 'double', etc. seem to be exceptions, for their scheme is  $\text{—} \cdot$ . In noting these exceptions, however, two points should be borne in mind. Firstly, these toned words have a historical origin, as indicated above; once passed current in the language, they have come to stay, but they do not seriously affect the present monotone tendency on the part of Lahnda speakers, especially owing to the second reason, viz. that both these tones disappear in a sentence whenever another syllable has become the prominent syllable, e.g.

[kôṛe ā pɛsa dɪo] 'give a pice to the leper'

$\text{—} \cdot \cdot \cdot \cdot$   
[kôṛe ā pɛ sa dɪo],

but cf.

[koṛe ā 'do pɛse dɪo] 'give two pice to the leper'

$\cdot \cdot \cdot \text{—} \cdot \cdot \cdot$   
[ko ṛe ā dō pɛ se dɪo],

where [kôṛe] loses the tone, when [do] 'two' becomes the nucleus. And even in the first example, [kôṛe], which, when pronounced isolated, has the high-falling tone, has no longer the characteristic tone, but a middle tone with only a direction towards a fall. The same may be said of the 'lower rising-falling tone', e.g.

[ɪtthe 'pṛ<sup>~</sup>ai baṛi caṅgi hōdi e] 'here the teaching is very good'

$\cdot \cdot \cdot \sqrt{\cdot \cdot \cdot \cdot \cdot \cdot \cdot}$   
[ɪt the pṛai ba ṛi caṅgi hō di e],

but cf.

[pṛai te ɪthe kōṛi vi nāi hōdi] 'the teaching here is good for nothing'

$\cdot \cdot \cdot \text{—} \cdot \cdot \cdot$   
[pṛai te ɪthe 'kōṛi vi nāi hō di],

where [p<sup>~</sup>rai] loses the tone.

The tones, then, do not affect the general scheme of intonation peculiar to Lahnda.

*Sentence Intonation.*

*Scheme I.*

*A. Plain Statements.*

The first scheme, which represents the predominant tendency in Lahnda, may be illustrated as follows:—

[mē ʌj 'sat vaje ghar ʈur vesā] 'I will leave for home at seven o'clock to-day'.

. . . — . — — — —  
[mē ʌj sat vɔ je ghar ʈur ve sā].

The same sentence in English will be thus represented:—

. — . / . — . — . ˘  
[aɪ li:v fe haʊm ət sevn ə klɒk tu deɪ]

It will be noticed that the intonation scheme in Lahnda is considerably similar to English. The prominent syllables occur only in those words which have semantic importance in the sentence, as [sat] 'seven', [ghar] 'home', and [ve(sā)] 'will go' in the above example. The prominence of the syllables is more monotone than in English, the intonation of the latter having a larger variation of stressed and unstressed syllables.

Three tones may occur in sentence-intonation, viz. the middle, the high-falling and lower rising-falling. Of these, the high-falling tone of isolated words tends to become the middle tone if it occurs in a prominent syllable of a monosyllabic word in a sentence. Otherwise, if the word occurs in pretonic or post-tonic position, the characteristic tone is entirely lost (cf. p. 94). Even syllables, which are commonly stressed when doubling occurs, and which, when isolated, would be represented as —, e.g. [gaddi] 'train', [vadda] 'large' similarly lose the stress before the most prominent syllable, as the following example will show:—

[ʌj gad(d)i 'car vaje asi] 'the train will come at four o'clock to-day'.

. . . — . . — .  
[ʌj gadi 'car vɔ je a si]

Note how the [d] of [gad(d)i] becomes single before the stressed syllable ['car] (cf. p. 86).

We shall now show that this scheme is predominant in Lahnda, beginning with the shortest sentences:—

(1) Plain statements.

[ʌj ʈhâddē] 'it is cold to-day'.

·     ˘     ˘  
[Δɹ̥ t̪h̥āɖ d̪e].

[o mɑɹ ɡiɛ] 'he is dead'.

·     —     ˘  
[o mɑɹ ɡiɛ].

The most prominent syllable generally belongs to the most significant word in the sentence, depending of course upon the *intention* of the speaker, e.g.

[mẽ laɦɑɹ v̪ɛs̪ɑ̃] 'I'll go to Lahore' may be represented in any of the three ways :—

˘     ·     ·     ·     ·  
[ˈmẽ laɦɑɹ v̪ɛ s̪ɑ̃] meaning, 'It is *I* that will go to Lahore'.

·     ·     ˘     ·     ·  
[mẽ la ˈɦɑɹ v̪ɛ s̪ɑ̃] 'I'll go to *Lahore*'.

·     ·     ·     ˘     ·  
[mẽ la ɦɑɹ ˈv̪ɛ s̪ɑ̃] 'I'll *go* to Lahore'.

The plain statement may refer to any event besides time and place: the same scheme will predominate :—

[us(z)d̪ə ˈʃakət ʃɑmɪɑ̃ ɛ̃] 'a son is born to him'.

·     ·     —     ·     ·     —     ·  
[us(z)d̪ə ˈʃɑ kət ʃɑm ɪɑ̃ ɛ̃].

The same scheme occurs in long sentences, as the following examples will show :—

[ɦɪk dɪɦɑɹɐ mɑɹɹɪ ɡɦɪn ke bɑɹ b̪ɛɪ tɑle b̪ê rɪɑ̃] 'one day, taking a couch, he sat down outside under a berry tree'.

·     ·     ·     —     ·     ·     ·     ·     ·     ·     ·     ·     ·     ·  
[ɦɪk dɪ ɦɑ ɾe mɑɹ ʃɪ ɡɦɪn ke bɑɹ b̪ɛɪ tɑ le b̪ê rɪɑ̃].

We shall now take a still longer sentence, and see how our scheme works.

[ɦɪk vɑɪɪ ˈcetre de m̪əɦɪnec ɦɪk p̪əɭvɑɪɪ ˈbɦɑ̃ɖdɪɑ̃ ˈbɦɑ̃ɖdɪɑ̃ dɪɔ̃ ˈlāt̪t̪he vele ɦɪk(k)ɪ ˈd̪ɦok̪ɑ̃ te vɑɹ rɪɑ̃] 'once upon a time, in the month of Chet, a Patwārī, wandering about, reached a hamlet at sunset'.

·     ·     ·     —     ·     ·     ·     —     ·     ·     ·     ·     ·     ·     ·     ·     ·  
[ɦɪk vɑ rɪ ce tre de m̪əɦɪ nec ɦɪk p̪əɭ vɑ rɪ bɦɑ̃ɖdɪɑ̃

˘     ·     ·     —     ·     ·     ·     —     ·     ·     ·     ·     ·     ·  
bɦɑ̃ɖdɪɑ̃ dɪɔ̃ tāt̪t̪he ve le ɦɪkɪ d̪ɦo k̪ɑ̃ te vɑɹ rɪɑ̃].

Of the above sentence of 29 syllables, only 6 syllables are prominent, which are the 'centres' of sense-groups.

Note how the quantity of [a] in [vari], [pət'vari] commonly long when isolated, has been reduced owing to pretonic position. Similarly, note [hiki] 'one', which is commonly pronounced with a double consonant [hikki], the quantitative reduction being due to the same cause. This quantitative reduction would not be noticeable if the corresponding sentence be pronounced in Panjabi or Hindustani.

As regards the relation of the most prominent syllable to other syllables, the following points may be mentioned:—

- (1) In unemphatic sentences, the most prominent syllable, whether polysyllabic or monosyllabic, if pronounced with a high-falling tone, tends to relatively lower the tone of the succeeding syllables.
- (2) If the most prominent syllable be pronounced with the middle tone, the immediately succeeding syllables are semi-low. If the prominent word is dissyllabic, its tone spreads over the two syllables.

The following examples will illustrate the above points:—

[Aɪ gaɖi 'dâ vaɟe asi] 'the train will come at ten o'clock to-day'.

The above sentence is unemphatic; the most prominent syllable occurs in a monosyllabic word and is accompanied by the high-falling tone; the tone of the succeeding syllables will be relatively lowered:—

... . ˆ ... .  
[Aɪ gaɖi 'dâ vaɟe a si].

The most prominent syllable occurs in a dissyllabic word and is high-toned; the tones of the syllables succeeding it are relatively lowered:—

[Aɪ gaɖi 'bârâ vaɟe asi] 'the train will come at twelve o'clock to-day'.

... . ˆ ... .  
[Aɪ gaɖi 'bâ râ vaɟe a si].

[Aɪ gaɖi 'câr vaɟe asi] 'the train will come at four o'clock to-day'.

The most prominent syllable in the above sentence has the middle tone, the immediately succeeding syllables are semi-low.

[Aɪ gaɖi 'câr vaɟe a si].

When the prominent word is dissyllabic, its tone is spread over the two syllables, as in

[o 'laga pɪa e] 'he is engaged'.

· — · · ·  
[o laga pɪa e].

The most prominent syllable may be just near the end of the sentence, though the last syllable in a plain statement being the finite verb,<sup>1</sup> will be generally at a low monotone, e.g.

[us<sup>2</sup> di dhru də nã sonə 'bai ɪa] 'the name of his daughter was Sona-bai'.

· · — · — · · —  
[us<sup>2</sup> di dhru də nã so nə bai ɪa].

Here the most prominent syllable is the last but one syllable, the last syllable [ɪa] 'was' is the verb, and has low monotone.

### B. *Emphasis.*

In Emphasis, the pretonic or post-tonic unstressed syllables are often considerably reduced in tone (except when the 'nucleus' belongs to polysyllabic word). The most prominent syllable follows the sense emphasized, whether that sense be contempt, abuse, disgust, threat, warning, affirmation, interrogation or solemn invocation, as the following examples will show :—

#### (a) *Contempt.*

['haɪ paɪe] 'get away!'

· · ·  
[haɪ paɪe].

#### (b) *Abuse.*

[ɖaɖa ho, rəkhēvə marni] 'get away, you wretch' (lit. may your protectors die!—addressing a dog).

· · · — · ·  
['dâ fa ho rə khē və 'mâr ni].

#### (c) *Disgust.*

[jêɾa milɛ, bhɛɾa i milɛ] 'everybody that I have met with has been bad'.

· · · · ·  
[jê ɾa mil ɛ, bhɛ ɾa i milɛ].

The use of pitch at the end of the comma is characteristic of sentences ending in a comma, as will be discussed presently.

<sup>1</sup> It may be noted here with interest that the Vedic finite verb was as a rule unaccented and has been so described by Indian grammarians.

(d) *Threat.*

[kʌdī hʌθ lɑ:ɡið te jɑ:d rakh sɛ] 'if ever you touch him,  
you will see (lit. remember) '.

· · · · · ∩ √ · ∩ · · ·  
[kʌ dī hʌθ lɑ: ɡið, te jɑ:d rakh sɛ].

(e) *Warning (insulting).*

['nikəl jɑ sɑɖið ɡhar] 'clear out of our house '.

— · — · —  
['nɪ kəl jɑ sɑ ɖið ɡhar].

(f) *Affirmation.*

[e vʌɖɑ 'd̪ɑɖɑ bʌndɑ e] 'he is a very cruel man '.

· · · · · ∩ · · · · ·  
[e vʌ ɖɑ 'd̪ɑɖɑ bʌn ɖɑ e].

(g) *Interrogation (questions of fact or inquiring reasons—  
emphatic).*

['hojɑ ke] or ['kê hojɑ] 'what then ? '

· ∩ /  
[ho jɑ ke].

∩ · /  
['kê ho jɑ].

[us̪ɑ 'kið mɑɾiɑi] 'why have you beaten him ? '

· · — — · /  
[u s̪ɑ 'kið mɑɾiɑ i].

['kitthe] 'where ? '

∩ /  
[kʰit the].

['kʌ<sup>(d)</sup>dən] 'when ? '

— /  
[kʌd dən].

(h) *Solemn Invocation.*

['cɑ khā dər 'bɑ:r, ɪs̪ɑ rok rəpʌjje 'ditte ʌe ni] 'do you  
swear by God ('Darbār'—the Sikh Granth) that you  
gave cash money to him ? '

— · · — · · · · · /  
['cɑ khā dər 'bɑ:r ɪ s̪ɑ rok rə pʌjje 'ditte ʌe ni].

*Scheme II.*

In Scheme II the prominent syllable is usually one, but there is a slightly high pitch or prominence at or near the end as well.

Scheme II may be represented by the following sentence :—

[tusi Δ<sub>I</sub> kAl 'ke kAm kərēde o] 'what are you doing during these days ?'

. . . . . - . /  
 [tu si Δ<sub>I</sub> kAl 'ke kAm kərē-de o].  
 (what) (doing) (are)

In English the corresponding sentence will have the following intonation :—

— . . — — —  
 ['hwət ə ju 'du ɪŋ ðiz deɪz].

We shall now study the scheme in detail, beginning with the shortest sentences.

(1) Questions of facts (unemphatic).

[tən 'ke ve] 'what has happened to you ?'

. / /  
 [tən 'ke ve]  
 (what)

It should be noted that the most prominent syllable here is at a high rising pitch.

[usã 'ke hojɛ] 'what has happened to him ?'

. . / . /  
 [u sã 'ke ho jɛ]

[tu usã 'ke akhɪɑ ɪɑ] 'what did you say to him ?'

. . . / . . /  
 [tu u sã ke akh ɪɑ ɪɑ].

[tusɑɖɑ huʃ ke hæl e] 'how are you now ?'

. . . . / . /  
 [tu sɑ ɖɑ huʃ ke hæl e].

It is not necessary that the most prominent syllable should be the interrogative pronoun, as the following examples will show :—

[tu sɑ ɖe ghar kɪthen] 'where is your home ?'

. . . / . /  
 [tu sɑ ɖe ghar kɪthen].  
 (home) (where)

[tusɑdɑ kɑm cɑŋgɑ cɑlɛ] 'is your business getting on well?'

· · · · · — · · · /  
[tu sɑ dɑ kɑm cɑŋgɑ cɑl dɛ]  
(well)

The same tune is followed in questions asking reason, the interrogative adverb having the high-rising pitch in unemphatic sentences :—

[usã kɪð mɑrɪɑ i] 'why have you beaten him?'

· · · / — · · /  
[u sã kɪð mɑr ɪɑ i].  
(why)

But in authoritative emphasis [kɪð] 'why' will have the high middle tone :— · · ·

[o 'kikəʃ mɑr gɪɛ] 'how has he died?'

· — · · · /  
[o 'kɪ kəʃ mɑr gɪɛ].

The dissyllabic nucleus has a higher pitch at the second syllable.

Or, the whole interrogative sentence may bear a semi-high pitch, the last syllable low-rising, as in

['rõdɑ kɪð pɪɛ] 'why are you crying?'

· · · · · /  
['rõ dɑ kɪð pɪɛ].

(2) Questions requiring the answer 'yes' or 'no'. In this case, besides the 'nucleus' the final syllable has a high pitch.

['jɑgde o] 'are you awake?'

— · · /  
[jɑg de o].

[cɑol 'khaso] 'will you take some rice?'

· — · /  
[cɑol kha so]

[tusi huʃ 'vɑllo] 'are you well now?'

· · · · · /  
[tu si huʃ 'vɑl lo].

[tusi 'gɑɛ ɔo ke nɔi] 'did you go or not?'

· · — · · /  
[tu si gɑɛ ɔo ke nɔi].



[suʃao pas ho gae o] 'well, have you passed (the exam.) ?'

. . . — . . . /  
[su ʃao pas ho gae o].

[tusi ʌj kal sel karn 'vẽde o] 'do you go out for a walk during these days ?'

. . . . — . — . /  
[tu si ʌj kal sel karn vẽ de o].

In an alternative the final pitch of the second question may not be high :—

[koi ghar â ke koi vi nə a] 'was there anybody at home or not ?'

. . . — . . . /  
[koi ghar â ke koi vi nə a].

In the same way, the final syllable may be at a low pitch in a question of self-deliberation or despair.

Self-deliberation :—

[huʃ mẽ 'ke 'kaṛã] 'what should I do now ?'

. . . — . /  
[huʃ mẽ 'ke ka ṛã].

Despair :—

[kiṣã ja ke ðassã] 'when should I tell ?'

. ˘ . . . /  
[ki ṣã ja ke ðas sã].

(3) Statements showing command, advice, warning, proposal, affection, courtesy, seriousness, negation, reproach, apology, etc.

The same scheme is followed in these cases, the syllables succeeding the prominent word being semi-low. If the most prominent syllable happens to be the final syllable, it gets the high pitch also.

(a) *Command.*

[bûa kholo] 'open the door'.

˘ . . .  
[bûa kho lo].

['laga vaɽ] 'you should go'.

— . —  
[la ga vaɽ]. The word [laga], it should be noted, is dissyllabic, and so the tone spreads over two syllables (cf. p. 94).





It will be noted that in the last four cases the tone does not rise at the final syllable. These cases therefore strictly follow Scheme I.

*Emphasis.*

(a) *Emphatic Questions* expecting the answer 'yes' or 'no' follow Scheme II.

[o 'raɛ] 'is he a *king* ?'

· — /  
[o 'ra ɛ].

[mẽ cor ã] 'am I a thief ?'

— · /  
[mẽ cor ã].

or 'am I a *thief* ?' [mẽ cor ã].

[te tudã 'ɖar nãi 'lagda] 'but, then, are you not afraid ?'

· · · — · · /  
[te tu dã 'ɖar nãi 'lag da].

[mẽ koi 'ɟalla vã] 'am I mad ?'

· · — · /  
[mẽ koi 'ɟal la vã].

(b) *Implications* (emphatic).

[o mât te nãi mərəɖa] 'he does not beat *me*' (i.e. he may have beaten somebody else).

· ˘ · · · ·  
[o 'mât te nãi mə 'rɛ da].

Even if the 'nucleus' is near the last syllable, the final syllable does not fail to have a slightly high pitch.

[mannja ɛ tusi baɾɛ 'ʃâ o] 'granted that you are a very rich man'.

— · · · · · ˘ ·  
[man nja ɛ tu si ba ɾɛ 'ʃâ o].

(c) Sentences implying *Wonder* :—

[tusi dɪn vɪc ə 't̪hârã 'ɟanɛ kam 'karde o] 'do you work eighteen hours a day ?'

· · · · · ˘ · · · · ·  
[tu si dɪn vɪc ə 't̪hârã ɟanɛ ɛ kam 'kar de o].

(d) *Welcoming* a person, especially on the part of a woman :—

[rakh sâi di] 'welcome!' lit. 'Protection of God'.

[rakh sâi di].

(e) *Urgency* :—

[mɪʃər 'paʃi 'trukka 'aʃi] 'cook! bring water soon'.

[mɪ ʃər 'pa ʃi 'truk kha 'a ʃi].

(f) *Implications* (unemphatic) :—

In this case the final syllable may not have a high pitch.

[o ʋal te 'ho 'vɛ si] 'he will recover, but—(may be permanently weakened)'.

[o 'ʋal te 'ho 'vɛ si].

[o 'pas te 'ho gɪɛ] 'he has passed the exam. (but gets no distinction)'.

[o 'pas te 'ho gɪɛ].

(g) *Request* :—

[e 'zara 'idde 'ho 'jaʃa] 'step aside a little, please' (corresponding to English 'thank you').

[e 'za ra 'id de 'ho 'ja ʃa].

A long sentence with many words ending in commas will follow Scheme II.

[mɪʃər, nai, 'dhabbe, 'eûre, 'paoli, 'sarɪan 'roʃi khə'va  
'you should feed all the cooks, barbers, washermen,  
sweepers and weavers'.

[mɪ ʃər, nai, 'dhab be, 'eû re, 'pa o li 'sa rɪ an 'ro ʃi khə  
'va].

(h) *Warning* (unemphatic) :—

[apʃe 'ʋadɪã 'nal tʃatʃʰa nâi karnã] 'you should not joke your elders'.

[ap ʃe 'ʋad ɪã nal 'tʃa tʃʰa 'nâi 'kar nã]

[hɛɾ nə 'kɑɾɪɑ kɑɾ] 'you should not do in this way  
(otherwise you shall repent) '.

.. — — . —  
[hɛɾ 'nə 'kɑɾ ɪɑ kɑɾ].

['ɑpʁɛ 'pɪŋdɛ di mu'tɪɑi 'tɛ mæg'ruɾi nə 'kɑɾo] 'you should  
not be proud of the stoutness of your body '.

— . . . . — . . . — . . . /  
[ʔɑp ʁɛ 'pɪŋdɛ di mu'tɪ ɪɑi tɛ mæg' ru ɾi nə 'kɑ ro].

### *Complex or Compound Sentences.*

(1) Interrogative complex or compound sentences follow Scheme II, the final pitch of both the principal and the subordinate clauses being high.

[mɛ̃ jɛ 'tɛ̃ɖi 'tɔpi ɛɑ 'ghɪnnã, tɛ tu'dã ɛ gal 'cɑŋgi 'lɑgsi]  
'suppose I were to take away your cap, would you  
like this thing ? '

/ . . . . — — . . . — . . . /  
[mɛ̃ jɛ 'tɛ̃ɖi 'tɔpi ɛɑ ghɪnnã, tɛ tu'dã ɛ gal cɑŋgi lɑg si].

[mɛ̃ 'ke 'burɑ 'kitɑ, mã pə'sɪnd ɑi tɛ mɛ̃ 'cɑ ghɪddi] 'what  
wrong have I committed ? I liked it and have taken  
it '.

. / . . . — . . . / — . . . / . . .  
[mɛ̃ kɛ bu rɑ ki tɑ, mã pə 'sɪnd ɑi tɛ mɛ̃ cɑ ghɪd di].

(2) Affirmative complex and compound sentences tend to follow a modification of Schemes I and II, in which the syllables of the actual principal sentence tend to be low, and the syllable with the highest pitch generally belongs to the subordinate clause.

#### *(a) Complex Sentences.*

The subordinate clause, being really an incomplete sentence, has generally two prominent syllables, the highest prominence being near the comma, as is often the case with syllables before the comma in Lahnda.

[jɛɾɑ pɛrmɛʃɾɛ ã mən'ju:ɾ ɛ, uɑ i hosi] 'whatever is the  
will of God, that will happen '.

. . . . . / / ˘ . — .  
[jɛ ɾɑ pɛr mɛʃ ɾɛ ã mən ju:ɾ ɛ uɑ i ho si].

[ɟis vɛlɛ ghɔɾɑ pɑʃiɛc 'vɑɾɪɑ, tã khə'lo: ɡɪɑ] 'as soon as  
the horse entered the water he halted '.

/ . . . — . / . — / . . . ˘ .  
[ɟis vɛ lɛ ghɔ ɾɑ pɑ ʃiɛc 'vɑɾ ɪɑ, tã khə 'lo: ɡɪɑ].

[us di e akhři ei, je ɟatti thar thar kammən laggi] 'he had hardly said this, when the peasant's wife began to shiver'.

· · · — · √ · · · — · — · — ·  
[us di e 'akhři ei, je ɟatti 'thar 'thar kam mən laggi].

Here the actual principal sentence is the second sentence, and so it is this which has a comparatively lower intonation.

In an interrogative sentence, however, the principal sentence may have a higher intonation :—

['kêra ē tū ɟis durō ī 'bhāo 'bhāo lai hoi e] 'who are you that is barking at a distance ?'

∩ · · · — · — · — · — · /  
[kê ra ē tū ɟis du rō ī bhāo bhāo lai hoi e] (cf. pp. 100 ff.).

### (b) Compound Sentences.

In a compound sentence the last sentence has a comparatively lower intonation, unless something special is to be emphasized :—

[unā 'khāda, utō 'paři pito nē, te mar gae] 'they ate (it), took some water after it, and died'.

· · · ∩ · · · — · — · · · — ·  
[unā khā da, utō paři 'pito nē, te mar gae].

[o khā:vəř betha, us nāo makhiā mar saṭiā] 'he sat down to eat, (and) killed nine flies'.

· — · — · — · — · — · — ·  
[o kha vəř bə tha, us nāo makhiā mar saṭ iā].

### QUANTITY.

Of the ten Lahnda vowels, four are short, viz. [ɪ], [ʊ], [ʌ] and [ə], as in [mis] 'a kind of pulse', [rus] 'be angry', [ras] 'a kind of lotion for the eyes', [us də 'jəkət] 'his child'. The other six vowels [i], [e], [ɛ], [a], [o], [u] are long; but they maintain their length only under certain conditions. (1) They are long in monosyllables, provided they are neither pretonic nor posttonic, e.g. [ris] 'envy', [les] 'a fluid', [hes] 'a debate', [rus] 'sign of the Zodiac', [ros] 'anger', [rus] 'Russia'. (2) These vowels are even longer when at the end of (stressed) monosyllables, as in [pi] 'drink', [ne] 'is it?', [je] 'victory', [pa] 'put', [ro] 'weep', [su] 'delivery'. But when these vowels are in polysyllabic words, they tend to be short even in the final position (provided that they do not have a particularly strong stress at the final syllable, as in [cə'la] 'set in motion'

but cf. [ˈcɔlɔ] 'custom', e.g. the final [i], [e], [ɛ], [a], [o], [u], and [e] of [ˈkaki] 'a girl', [ˈkake] 'boys', [ˈjɔtɛ] 'has known', [ˈkaka] 'a boy', [ˈkako] 'O girl!', [ˈkaku] 'a boy' (in endearment) respectively are short or very nearly short. Similarly both the [a]'s of [ˈkaka] 'a boy' are short; in fact the first [a] of [ˈkaka] 'boy' seems to be even shorter than the [ʌ] of [ˈɾas] 'lotion for the eyes'.<sup>1</sup> Again, [a] in [pa] 'put' has full length, in [pap] 'sin' it is also long, though a little shorter, but both the [a]'s of [ˈpapa] 'a leaf' are short, or very nearly short. Similarly the [i]'s in [ˈsiɪ] 'a whistle' and the [e]'s in [ˈpeke] 'parental home' are not long. The [i]'s of [ˈsiɪ] 'a whistle' are not longer than the [ɪ] of [ˈɪd] 'horse's dung', though they are appreciably longer than the [ɪ] of [ˈɪt] 'a beam in the eye'.

A vowel pronounced with the high-falling tone tends to be slightly shorter than when it is toneless, thus the [a] of [pâ] 'manure' and the [ɛ] of [lê] 'descend' are slightly shorter than the [a] of [pa] 'put' and the [ɛ] of [lɛ] 'take' respectively.

In the pretonic or post-tonic positions the quantity of the Lahnda vowels is reduced very considerably, thus the final [i] in [siɪ ˈnal] 'with a whistle' or in [mã ˈsiɪ de] 'give the whistle to me' [ɛ] in [jɛ ˈdai] 'name of a woman', the second the third and the fourth [a]'s in [ˈkala ʃa (ə) ˈkaku] 'name of a village' are very short.

A vowel seems to be also shortened before a double consonant, e.g. the [ɪ] of [mɪtti] 'clay' is considerably shorter than the [ɪ] of [khit] 'heel' or [ɪt] 'a beam in the eye'.

In the stressed position, a vowel tends to be long when it is *final*, thus the final [a] in [jɛ ɾam ˈdas] 'name of a man', and the final [e] in [e tere peke ˈne] 'is it thy paternal home?' are long. Otherwise the stressed vowel may be short, though it is considerably longer than the pretonic or post-tonic vowels. Thus in [kala ʃa ˈkaku] 'name of a village', the [a] of the syllable [ka] receives the strongest stress, but it is short. On the other hand, in [e tere peke ˈne] 'is it thy paternal home?' the [e] of the stressed syllable [te] is long, though it is considerably shorter than the [e] of the final word [ne] 'is it?'.

Vowels before voiced consonants are slightly longer than before the breathed ones, cf. [ɪt] 'a beam in the eye' but [ɪd] 'cow's dung', [ˈsiɪ] 'a whistle' but [ˈpiɾe] 'pain' (oblique): here [ɪ] and [i] before [d] and [r] respectively are longer than before [t] and [t̪].

Diphthongs are shorter when pure, thus in [jɛ ˈdai] 'name of a woman', [ai] is shorter when it is a pure diphthong; it is longer when there is a minimum of prominence between [ʌ] and [i].

<sup>1</sup> Kymographic tracings from my pronunciation have given the above facts.



Of the 31 diphthongs, the following four have their second element long :—

[ɔi] as in [jɛ dɔi] 'name of a woman'.

[uɑ] as in [duɑni] 'a two-anna piece'.

[io] as in [ghio] 'ghee'.

[iu] as in [piu] 'father' (oblique).

The longer quantity of the second element makes them rising diphthongs.

The quantity of a consonant does not seem to be considerably affected by the preceding vowel, thus the [s] in [ras] 'eye-lotion' and [ras] 'sign of the Zodiac', [rus] 'be angry' and [rus] 'Russia' only slightly varies in quantity. This seems to indicate that Lahnda is not a language of 'dynamic stress'.

The quantity of consonants is significant in Lahnda, as in ['sati] 'chaste' but ['satti] 'seventh' (in playing card-), for further details see p. 86.

It has been shown in the above pages (94, 97) that in connected speech the quantity of a particular syllable is an incident of rhythm. The above rules of quantity, therefore, are subject to this important condition. Thus the [ɑ] of [pɑ] 'put' is no doubt very long, but it becomes very short even in the unemphatic sentence ['dɔlic luʃ pɑ] 'put some salt in the lentils'. Similarly even the significant double consonant of a word like [satti] 'seventh' is considerably shortened when the stress-receiving 'nucleus' is some other word, as in [jɛ 'ɕiri(j)ɛ di sati nã hõdi] 'if I had not the seventh (sati) of spades'.

#### SYLLABIC DIVISION.

Syllabic division, like quantity, is mostly an incident of rhythm. If syllabic division is really a demarcation of the various peaks of prominence in connected speech, the real peak in Lahnda rhythm being generally the 'nucleus' and only a few prominent syllables in the sentence, the actual division in Lahnda is not so much syllabic as between the 'nucleus' and the other lower syllables. Among the less prominent syllables it is generally a matter of convention where we divide.

With the above reservation, the following rules of syllabic division in Lahnda may be laid down :—

(1) Intervocalic consonants tend to go with the succeeding syllable, and a striking evidence of this is the doubling of the final consonant before an initial vowel (see p. 86). Thus the words [jat, ɑ] ('peasant, was') when in connected speech become [ʃatʃ ɑ], the doubling being intended to bring the [t] to the succeeding syllable. In dissyllabic words also, although no doubling occurs, the tendency is apparent, e.g. ['do puttər ʌɛ] 'there were two sons' is actually pronounced ['do puttə rʌɛ].

It is a significant fact that in dissyllabic words the high-falling tone is always on the first, and never on the second, syllable, cf. [kôṛa] 'a leper' but [krâ] 'pudding'. In such dissyllabic words, therefore, the division of prominence is easy, the [r] of ['kôṛa], the [r] of ['dôṛa] 'double' and the [n] of ['kâna] 'name of a man' belong to the succeeding less prominent syllable.

But in monotone isolated dissyllabic words like [vakət] 'time', [karəd] 'knife', it is difficult to say whether the intervocalic consonant belongs to the preceding or the succeeding syllable. It is rather divided between the two syllables. In connected speech especially, the division will be pure convention. The difficulty is aggravated in the case of diphthongs and the so-called 'triphthongs' as in [aia] 'came', [pâṛie] 'let us read', where it is difficult to determine whether the [i] and the [i] belong to the succeeding syllable.

(2) The case of consonant-groups, however, is easier. As there is generally a plosion of a consonant before another, the syllabic division of ['admi] 'man', ['apṛi] 'one's own' will be [ad/mi], [ap/ṛi], other things being equal.

A plosive before [r] and [j], however, presents some difficulty when the word is unstressed, as in [khatṛi] 'car pese ditte' 'the Khatri gave four pice'. It is here difficult to say to which syllable to assign the [t] of [khatṛi], because [t] is not exploded before [r]. But the case is easier when the word is stressed and is pronounced ['khattṛi], the first acoustic [t] will then belong to ['khat], the second to [tri].

## APPENDIX A.

### *The Janam Sākhī<sup>1</sup> of Guru Nānak.*

The oldest literary record in Lahnda is a portion of the biography<sup>2</sup> (*janam-sākhī*, 'witness of life') of Guru Nānak, the date of which is said to be 1654 A.D., as the opening line of the work mentions the 5th of Besākh Samvat 1597 as the date when this book was written by Paṛā Mokhā, a 'Khatreṭā' of Sultān-pur.<sup>3</sup> He acted as scribe, while the work was actually dictated by Bhāi Bālā, a disciple of Guru Nānak.

This work contains 170 Sākhīs or chronicles, of which only 25 Sākhīs show definite traces of Lahnda, although even in these

<sup>1</sup> The transcription used in the Appendices is not phonetic, but it follows the *transliteration* scheme of the Royal Asiatic Society. Both the works examined being literary, it is not sure what the actual pronunciations of the writers were. It has been therefore considered safer to use *transliteration*.

<sup>2</sup> Published by Gulāb Singh and Sons, Samvat 445 of Nānak.

<sup>3</sup> Page 5.

Panjabi is more predominant. The most important Sākhī in Lahnda is the chronicle of Lālo on pp. 78 ff., next in importance is Nānak's journey to Mecca, pp. 123 ff. Other interesting Sākhīs for our purpose are the chronicle of Nānki, pp. 235 ff. and interview with Farid, pp. 361 ff.

The language of these 25 Sākhīs is characteristic of the one spoken by Sādhus at the present day. It is a mixture of broken Hindi, Panjabi and Lahnda, and betrays the language of a traveller who has either forgotten his mother-tongue or has adapted his speech to the linguistic environment of the people with whom he comes in contact, as he goes from place to place. The following specimens will show the mixed nature of this dialect :—

- (1) p. 377 : [mar vanjāge] ' we shall die '.
- (2) p. 95 : [khoṭe ko saṭṭ detā hā] ' he throws down the corrupt '.
- (3) p. 42 : [jivē tusī ākhsō. tivē hī karāge] ' we shall do as you will say '.
- (4) p. 465 : [asī tādē pīr dī mulākāt ko jāte āhe] ' we were going for an interview with your teacher '.
- (5) p. 41 : [avo kālu vatt kyā hoyā hā ?] ' O Kālu, well, what has happened ? '.

This dialectic medley considerably reduces the value of the work for our purpose. The following conspectus of the grammar, syntax and vocabulary of the Lahnda occurring in this work may be of interest :—

The grammatical structure of the language indicates Central (Grierson's 'Standard') Lahnda. There occur only a few examples of Southern L., in which [kū] instead of [nū] appears as post-position, cf. [asā kū] ' to us ' (p. 132), [mā kū] (p. 133) : Southern cerebralization occurs in a few cases like [ḍukhre] (p. 152), [dehre] for [dehre] (p. 138). All these specimens occur in the Sākhī on Mecca. Otherwise there occurs no Southern cerebralization, while the post-position for the dative and the accusative is [nū] throughout. The oblique singular is characteristic of the Central, it has no [e] except in a few examples like [dile dā] (p. 173), [karāc vic] (p. 88), [rūhe dī] ' of the soul ' (p. 173). The pronoun is also characteristic of the Central ; the stem [ter- mer-] is used throughout except a single instance [tādē] on p. 465. The second person plural is [tusādā] throughout, while the agent case singular is [tudh], e.g. [tudh mānū aj nihāl kitā] ' thou hast delighted me today ' (p. 79).

As regards the verb, the present tense is formed from the present participle, and the interesting form khavāindā, the prototype of [khavādā] has been mentioned above (cf. p. 52). The pres. part. has generally [dā], though in some instances [nā] also occurs [tū oh nazar āvnā hā] ' thou appearest to be he ' (p. 78).

The past continuous sense is similarly formed, cf. [karēde āhe] 'they were doing' (p. 81), and the stem for 'was' or 'were' is [āh-] throughout; the interesting form [āhiā] also occurs. There are instances in which the passive 3rd person plural ends in [-ian], cf. [kahian] 'are called' (p. 133), [cun cun kaḥian phuṭṭiā] 'balls of cotton are plucked and taken out' (p. 153). The modern forms in Kahūṇi, e.g. [marin], [kuṭin] may be traced to [\*marian], [\*kuṭian] likely to have occurred in the language of our author. These examples indicate that the Prakrit [j] of the passive was lost in the Central several centuries ago, though in others it is still preserved, cf. Multani [marijan]. Central [marivan] finds a parallel instance in [pakrivan] on p. 81. The [i] of the passive is further illustrated by the pres. part. (passive) [uṭhāiti], p. 41. In Kahūṇi the preceding ā has been shortened, e.g. [cēḍi], from [cā] 'to lift'.

As regards syntax, we do not find any instances of the auxiliary [cā] for the Perfective, cf. p. 54; the Central [ghatt] is used in [saṭṭ ghatt] 'throw it away' (p. 294), both the verbs being literally synonymous. Another interesting way of expressing the Perfective is by the present participle form, e.g. [caldā rihā] 'he went away' (p. 239), [calde rahe] (p. 507), cf. Hindi [jāte rahe]. The [rahe] 'left' or 'kept' has the sense of 'finished'; [bane] is also used in Hindi in this sense; cf. [calte bane]. On the other hand, the present continuous has been expressed by the auxiliary verb [vad-] 'to wander' (Skr. [vartt-]), cf. [niśāniā makke diā vadiā hā] 'signs of Mecca are (appearing)' (p. 131), cf. modern Central [jādā vadā he] 'he is going'.

There are a few instances in which the post-position [ne] does not follow the oblique case with the transitive, e.g. [us dittā] 'he gave' (p. 91), [tudh kitī hā] 'thou hast done' (p. 128), [mardāne giṇṭi khāḍi] 'Mardānā began to worry' (p. 79). This absence of [ne] finds a parallel in modern Northern dialects like Kahūṇi.

There are occasional examples of elliptical repetition which remind one of the style of the Brāhmaṇas, cf. [man likhaṇ-hārā, likhiā so kyā likhiā? māyā kā janjāl likhiā] 'the mind was the scribe. And it wrote—what did it write?—it wrote the magic of Māyā' (p. 8); [āge dekhē, tā kyā dekhē] 'further, they saw, and what did they see?' (p. 457); [Lālo jāi dekhe, tā kyā dekhe] (p. 81) 'Lālo went and saw, and what did he see?'

As regards vocabulary, the following striking words may be mentioned:—

### I. Nouns derived from Sanskrit.

[malār] 'gardener' (p. 453). Kahūṇi has [maliār], Skr. [mālākāra-]. The Kahūṇi form, however, seems to be more archaic, representing a stage before the single contraction [ā] had been effected. Similarly Punjab-L. [suniārā], Hindi [sunār].

[*ban-māṇu*] 'man-ape' (p. 100). Here [*māṇu*] is exactly parallel to Lahnda [*māṇu*], for in Lahnda we have three different words for 'man', each of which has a different nuance. [*manukh*], a loan-word from Hindi, means 'man in general'; [*munas*] is 'a paramour'—a term of abuse; while [*māṇu*] is a grotesque or odd person, and this meaning finds a parallel in the example before us.

[*jañṇu*] 'sacred thread' (p. 78). This is the Northern L. word for Skr. [*yajñopavita*], Panj. and Sindhi being [*janeu*]. [*jañṇu*] seems to be a more archaic form and indicates the Northern L. tendency to *yamas*, thus for [*vanj*]. South.-Cent. 'to go' we have North. L. [*vañṇ*], for Panj. [*vaṅgā*] 'bracelets', N.L. has [*vañṇā*].

[*pāli*] 'a shepherd' (p. 508), a general term used for the particular, going back to Skr. [*\*(ajā)-pālika*]. Modern Lahnda has [*ājari*].

[*tapā*] (p. 81) or [*tapāji*] (p. 457) 'an ascetic'. [*tapā*] may presumably be traced to an analogical [*\*tapakah*], but the formation of [*tapāji*] is obscure.

[*śih*] 'tiger' (pp. 130, 377). Modern Lahnda and Sin. are also [*sī*] and [*śih*] respectively. Besides the latter, Trumpp (p. XVI) gives another example of initial Skr. [*s*] becoming [*ś*] in Sindhi, viz. [*śādh*] 'a rich man' from Skr. [*sādh*]. Panj. and L. also have [*śā*] 'a rich man', but it may be related to Persian [*šāh*] 'a king'. The example from our author shows that this palatal substitution for [*s*] in [*śih*] is fairly old.

[*virāg*] 'feeling of separation', e.g. in [*mā bahut virāgi sī*] 'I intensely felt the pang of separation' (p. 235). It is in this sense that the word [*virāg*] occurs among illiterate Lahnda speakers at the present day.

## II. Nouns derived from Persian and Arabic.

[*khāvand*] in the sense of 'owner'. [*is lāl dā khāvand ākhdā hā*] 'the owner of this ruby says' (p. 91); [*bhāvē khāvand vece*] 'whether the owner sells it' (p. 91). This use of [*khāvand*] in the sense of 'owner', as it is in Persian, indicates that [*khāvand*] 'husband' Panj.-L. [*khaūnd*] is a comparatively recent usage, the Persian word for 'husband' being 'šauhar', the corresponding Panj.-L. [*śaū*] being used only in poetry.

[*malak*] 'title of a Khatri' (p. 80). [*malak bhāgū herar khatri sarin sī*] 'Malak Bhāgū Herar (?) was a Sarin Khatri' who is said to have given a dinner to Brahmans. In modern Lahnda [*malak*] is a title among Muslim landowners, but more often a term of courtesy for Āwān cultivators and camel-drivers. According to Johnson (Persian Dict.) [*malkā*] in Zand and Pazand means 'a king', while in Persian we have [*milkdār*] 'a landowner'. Our author indicates that even Khatrias had this

title in the 16th century, as some of them bear at the present day.<sup>1</sup>

[tagīd] 'insistence' (p. 83), Sin. tāgīd, Arabic tākid. This vocalization of k occurs also in the final position in [nisaṅg] 'fearless', Skr. [niḥśaṅka-]. [bhāi tu nisaṅg ho] 'brother, be fearless' (p. 423). Modern Lahnda-Panj. [niṣaṅg].

[mahram] 'an intimate knower of one's secrets'. [is de hāl de āp mahram ho] 'you are familiar with the secrets of his affairs' (p. 43). The word is common among illiterate Lahnda speakers and occurs in one of the most popular Lahnda songs:—[māḍe hāle diā mahrmā ḍolā] 'O dear, the intimate knower of my secret'.

### III. Verbs derived from Sanskrit.

[pahutā] 'reached' (128, 132), a common form in L. Panjabi [pāūc-], Hindi [pahūc]. The L. form is possibly connected with Apabhramśa [pahoiam] 'satisfied' mentioned by Hemacandra in his Deśi-nāma-mālā (pp. 190, 191).

[saṁtāyā] 'tortured'. [mānū bhukh ne baṛā saṁtāyā hā] 'hunger has tortured me' (p. 336), a form older than modern Hindi [satāyā], Skr. [saṁtāpaya-].

[vaṇḍ-] 'to quarrel' occurs in [jā mardā nū diṭṭhō ne tã laggiā āpas vic vaṇḍiā pāvan] 'when they saw the men, they began to quarrel among themselves' (p. 336). This is an idiomatic sense of [vaṇḍ-] 'to divide', but radically it is the same as the verb [vaṇḍ-] 'to divide' in Pāṇini's Dhātu-pāṭha.

[khap-] 'to be irritated'. [tū bhī roj khapdā hā] 'thou art also irritated every day' (p. 41). This is a common verb in Lahnda, cf. Sindhi [khapaṇu] 'to be irritated', from Skr. [kṣapaya-] 'to exhaust'. The causative form in Lahnda is [khopā] 'to tease'. It is interesting to note how in both the languages the original sense of exhaustion has led to the semantic change into 'irritation',—a psychological phenomenon natural to fatigue.

### APPENDIX B.

#### *The Asrār-i-Farīdī.*

The Asrār-i-Farīdī is an entirely modern work, and its authorship should not be confused with either of the other two Farīds. In the history of Muslim saints in the Panjab there have been three Farīds:—

(1) Bābā Shaikh Farīdu-d-Dīn Sāhib Shakar Ganj of Pāk-ṭaṭan in the Montgomery District,<sup>2</sup> who died in 1265-66 A.D., wrote in Persian, and the *baits* or short poems attributed to him and published by Malak Dīn Muhammad, Bookseller, Lahore,

<sup>1</sup> Cf. Malak Devī Dās, a rich landowner of Shāhpur District.

<sup>2</sup> *Punjab Gazetteer*: Montgomery Distt. for 1918, pp. 234-237.

are really the authorship of one Pir Bakḥsh who gives his name at the end of every couplet, and whose language is not Lahnda, but Panjabi.

Another Farīd known as Bābā Farīd or Shaikh Farīd is traditionally known as a contemporary of Guru Nānak, and in the Janam Sākhī we find a whole Sākhī (pp. 361 ff.) devoted to Nānak's interview with Farīd. Farīd's language in this interview is Lahnda, as may be seen from the following couplet (p. 361) :—

[ake tāṭ loṛ mukaddamī ake tāṭ allāh loṛ  
do beṛī nā latt dhar mat vanjē vakkhar boṛ]

‘either seek after law-suits or seek after God; do not  
put thy foot (‘leg’) on two boats, lest thou shouldst be  
drowned’.

The oblique forms [mukaddamī] and [beṛī], and the words [vanjē] and [boṛ] are clear specimens of Lahnda. The ‘Kāfis’ or short poems attributed to this Farīd have been incorporated into the Ādi Granth and published as a separate booklet by Sant Singh and Sons, Lahore. It has a few traces here and there of Lahnda, e.g. [karendī] (p. 4), [jindū kū] (p. 1), [jāsi] (p. 1), the oblique in [matī dēdiā] ‘giving advice’ (p. 5) and the vocabulary such as [nandharā] (p. 3), [thī] ‘be’, [biā] ‘another’ (p. 5), the nominative plural in [rātī vaḍḍiā] (p. 7). But on the whole the treatise is in Hindi and Panjabi.

The work before us, however, the Asrār-i-Farīdī, better known as Diwān-i-Farīdī<sup>1</sup> is written in Lahnda *par excellence*, and although quite modern, is worthy of study, considering the poverty of literature in Lahnda. The author is Khwāja Ghulām Farīd,<sup>2</sup> a Muslim saint who became the see-holder [sajjāda-našin] of the shrine at Cācraṇ Sharif (in Bahawalpur State) in 1870.

The language is consistently Southern L., cerebralization of initial consonants for corresponding Skr. voiced unaspirated consonants being maintained throughout, e.g. in [devam] (p. 17), [ḍukh] (p. 3), [ḍin] (p. 16). In noun and pronoun declension the agent case has the termination [ē] for masculine, related to Skr. [ena], e.g. [ḍukh ḍukhrē jēra tāyā] ‘the trouble which has been aggravated by this calamity’ (p. 3); [jē kul rāz sujhāiā] ‘by which all the mystery has been revealed’ (p. 9).

The language is rich in diminutive forms, e.g. [gujhrē hāse] ‘hidden smiles’ (p. 9), [tāḍrā vārā] ‘thy turn’ (p. 7), [hañjṛū] ‘tears’ (p. 10), [be patṛī] ‘dishonourable’ (p. 10), [aukhariā ghātā] ‘hard blows’. Most of these diminutive forms probably appear *metri causa*, but in shorter forms like [patṛī], [tāḍrā], the diminutive may be due to the need for a distinctive meaning, cf. Lithuanian [moter] ‘wife or woman’, [moteriške] ‘woman’.

<sup>1</sup> Published (1902) by Miān Khudā Bakḥsh, Ghais Bakḥsh, Lahore.

<sup>2</sup> *Punjab Gazetteer*, Bahawalpur State, p. 181.

The vocabulary is characteristic of Lahnda, but occasionally presents interesting variation of nuance from corresponding North. Lahnda words.

[bhas] 'ashes'. [išk de rāh vic bhas pāya] 'threw ashes in the path of love' (p. 10). The word is characteristic of Lahnda; Sin. [bhasu], Skr. [bhasma-].

[galakṛi] (p. 16) 'an embrace'. N.L. [galangrī] or [galvangrī] 'throwing arms round one's neck'. The phonetic connection between the N. and the S. words is obscure.

[sahams=sahasra-] (p. 21). The nasal infix in the illiterate pronunciation of [sahasra-] is also current in N.L., where it is pronounced [sahamsar], with a Svarabhakti.

[hikjā] and [bejā] for 'first' and 'second' respectively (p. 18). The stem [hik] in the ordinal is interesting, N.L. and Panj. have [pālā], N. [hikallā] means 'alone'.

[sālā] 'may God' (p. 20) is used by illiterate Muslims for Arabic [in-šā'-Allāh] 'may God wish'.

[sir-sūl] 'headache' in [sir sūl tāyā] 'headache has troubled me' (p. 11). When physical pain is intended, N.L. uses the word [sūl] exclusively for *abdominal* pain, and so does Panjabi, cf. Sindhi [sūli] 'the gripes', Skr. [śūla-], but for other pains N.L. has [pīr] as in [sir-pīr] 'headache'. But in figurative speech [sūl] in N.L. suggests 'intense pain', e.g. [tudā ke sūl e] 'what agony do you have?' said to a person without any serious trouble. S.L., then, seems to have further generalized the meaning of [sūl].

[hokā] 'proclamation' (p. 8) is a word peculiar both to S. and N., Sin. [hoko], Skr. [hve] 'to call'. Panj. has [tāṇḍhora], The pres. part. is consistently formed by [ēdā], e.g. [kahēdā], [sujhēdā], [sahēdā] (pp. 14, 17). The pres. part. continuous (adjective) is formed by the suffix [ē], going back to Skr. [an], e.g. [rātī rōḍē tapḍē khapḍē] '(I passed) the night crying, burning and worrying' (p. 16). Similarly [dukhḍē] 'burning', [dukhḍē] 'suffering', [jhukḍē] 'grumbling' (p. 24).

There are a few interesting past part. like [nītā] in [āpne nāl na nītā] 'he did not take me with him' (p. 19), [vihāṇī] 'passed away', [kāg uḍāde umar vihāṇī] 'I have wasted my career in flying crows' (p. 16). Both these forms appear to be nearly the same as in Skr., but they are really analogical like [kitā], [dinnā].

The Causative proper is formed by [vā] as in [sir kapvāyā] 'caused the head to be cut off' (p. 7); the transitive causative is formed by [lā] or [ā], as in [muklāyā] 'released' (p. 2), [valāiā] 'turned' (plural) (p. 2).

The syntax is rich in pronominal suffixes, as Southern Lahnda is. The suffix [m] is used both for the nominative and the dative, e.g. the nominative in [āyam zulam kahar vic] 'I came to torture and misfortune' (p. 28), but the dative in [āyam Faridā sakṭi dā sāyā] 'O Farid, the shadow of trouble has



come to me ' (p. 11), [koī puchaṇ na vêre āyam] 'nobody came to my courtyard to inquire after me ' (p. 14).

The perfective is formed by groups of different verbs, as [saṭ sadhāyā] 'came up ' (p. 11), [mār munjhāyā] 'killed out ' (p. 8).

There occur a number of striking particles, e.g. [toṇī] in [toṇī diṣdam sakḥt karib] 'although it may appear very near to me ' (p. 24). North. L. has [toṛe], Panjabi has generally [bhāvē], Dogri [bhaliā] = Hindi [cāhe], cf. Lithuanian [norint]. [toṛe] is related to [toṛ] 'end ' (lit. 'break '), referring to the object of the condition, i.e. 'though the end may be '. But the nasal form [toṇī] in our author is obscure. Another particle is [tāve] 'even then '=Skr. [tathāpi], North. L. has [tāvi]. The example indicates the Lahnda tendency to change the final [i] of particles to [e], cf. Panj. [ki] 'what ', L. [ke] or [kā].

## Āzād Bilgrāmī.

By SAYYID WAJAHAT HUSAIN.

As-Sayyid Ghulām ‘Alī ‘Āzād’ bin as-Sayyid Nūh al-Husainī al-Wāsiṭī<sup>1</sup> was born on Sunday, the 25th Šafar, 1116 A.H. (29th June, 1704 A.D.) in Maidānpūra, a locality in Bilgrām.<sup>2</sup> He received his early education from Mir Ṭufail Muḥammad Bilgrāmī<sup>3</sup> who was a renowned scholar of his age. Next, he studied books on literature, rhetoric and prosody under his maternal uncle as-Sayyid Muḥammad<sup>4</sup> bin as-Sayyid ‘Abd al-Jalil Bilgrāmī. His maternal grandfather as-Sayyid ‘Abd al-Jalil Bilgrāmī<sup>5</sup> was a versatile scholar whose fame in the

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<sup>1</sup> Wāsiṭ is the name of a city founded in ‘Irāq by al-Hajjāj bin Yūsuf, between the year A.H. 83–86 (A.D. 702–705). Al-Hajjāj made a permanent camp for the Syrian troops at a place in ‘Irāq with the object of putting an end to the troubles between them and the ‘Irāqīs. This new place where the soldiers were stationed was given the name Wāsiṭ (middle) for it was roughly midway between Kūfa and Baṣra, which were the two principal cities of ‘Irāq at that time.

One of the ancestors of Āzād, named Abū’l Fath, settled there and consequently the family is called ‘Wāsiṭī Sayyids’. *Ma’āthir al-Kirām*, p. 270.

<sup>2</sup> Bilgrām is the headquarters of the *Taḥṣīl* of the same name, Hardoi District, United Province. It has produced a number of Muhammadans who have attained distinction as officials or in literature. *Imperial Gazetteer of India*, vol. VIII, p. 235.

<sup>3</sup> Mir Ṭufail Muḥammad Bilgrāmī was born, 1073 A.H. (1662 A.D.) and died 1151 A.H. (1738 A.D.). See *Ma’āthir al-Kirām*, pp. 149–58.

<sup>4</sup> Sayyid Muḥammad was born in 1101 A.H. (1689 A.D.) in Bilgrām. He was appointed on his father’s retirement to his post of Bakhshī and Waqā’i’ Nigār in Siwistān, and held it throughout the troubled period of Nādir Shāh’s invasion. He left Siwistān in 1155 A.H. (1742 A.D.) and in the following year settled in his native town where he lived on to an advanced age. See *Ma’āthir al-Kirām*, pp. 293–96 and Rieu, *Br. Mus. Cat.*, vol. III, p. 963.

<sup>5</sup> Sayyid ‘Abd al-Jalil, a member of the ancient family of the Wāsiṭī Sayyids who claim to have settled since 614 A.H. (1217 A.D.) in Bilgrām, was celebrated for his profound knowledge of Arabic and his eminent piety. He entered the service of Emperor Aurangzib (A.H. 1069–1118; A.D. 1659–1707) and discharged the duties of Bakhshī and Waqā’i’ Nigār from 1112 A.H. (1700 A.D.) to 1116 A.H. (1704 A.D.) in Gujrāt, and from 1117 A.H. (1705 A.D.) to 1130 A.H. (1717 A.D.) in Bahkar and Siwistān. He then retired to Delhi, where he died in 1138 A.H. (1725 A.D.) at the age of sixty-six. See *Ma’āthir al-Kirām*, pp. 257–77 and Rieu, *Br. Mus. Cat.*, vol. III, p. 963. Among his compositions the following are well-known :—

(i) *Tabsirat an-Nāzirīn*, historical and biographical notices relating chiefly to Bilgrām. Rieu, *Cat.*, vol. III, p. 963.

(ii) *Amwāj Khayāl*, a *mathnavī* in praise of Bilgrām. *Ma’āthir al-Kirām*, p. 266.

literary world reached the distant parts of the world. As the greater part of the life of this scholar was spent abroad in the service of the state, Āzād was not fortunate enough to enrol himself in the list of his pupils until the age of seventeen when he returned home after a protracted absence of sixteen years. Āzād never lost sight of the opportunity to study under him. He accompanied him on his tour to Delhi, the then capital, and continued his studies diligently under him. Within a few years Āzād became well-versed in numerous branches of learning and the occasional remarks of Mawlānā 'Abd al-Jalil that Āzād would keep the torch of learning and lore shining with the same lustre even after his death bear ample testimony to the scholarship of Āzād.

After completion of his studies Āzād returned home in 1137 A.H. (1724 A.D.) and became a disciple of Sayyid al-'Arifin Mir Sayyid Luṭfallāh<sup>1</sup> in *chishtī* order.<sup>2</sup> In 1142 A.H. (1729 A.D.) he left his home and visiting Delhi, Lahore and Multan, reached Siwistān, a town of Sind, in 1143 A.H. (1730 A.D.) where his maternal uncle as-Sayyid Muḥammad was Mir Baḡhshī (Pay-master General).<sup>3</sup> His maternal uncle secured for him the post and himself retired. Āzād creditably discharged the duties of the post for about 4 years, and after submitting his resignation in 1147 A.H. (1734 A.D.) came to Allahabad with the object of meeting his parents. He stayed there for some time and then returned to Bilgrām. From early youth Āzād had cherished an earnest desire for pilgrimage and the vision of the

- (iii) A *Mathnavī* on the marriage of Emperor Farrukh Siyar (A.H. 1124-1131; A.D. 1712-1718). A copy of this *mathnavī* is in M. 'Alī Husain's Library, Hyderabad, Deccan. Āzād Bilgrāmī's handwritings are in some places in this MS. Ḥāfiẓ Nazir Aḥmad, *Descriptive Notes on Libraries, Journal and Proceedings, Asiatic Society of Bengal, New Series*, vol. XIV, 1918, No. 8, p. cccviii, No. 210.

<sup>1</sup> Mir Sayyid Luṭfallāh, son of Sayyid Karamallāh, was a very famous saint at Bilgrām. He died in 1143 A.H. (1730 A.D.). See *Ma'āthir al-Kirām*, pp. 108-113.

<sup>2</sup> The oldest of the *darwish* fraternities in India is the *Chishtī* order, which traces its origin to Khwājah Abū Abdāl Chishtī, who died A.D. 966. It was introduced into India by Khwājah Mu'in-ud-Dīn Chishtī, of Sistān, a southern district of Afghānistān, where he was born A.D. 1142. He later removed with his parents to the region of Khurāsān, and thence to the neighbourhood of Nishāpūr, near Mashhad, where he became the disciple of Khwājah 'Uṭhmān Chishtī Hārūnī. After more than twenty years' discipleship, he went on a pilgrimage to Mecca and Medina. Then he made a journey through Iraq and Persia, during which he made the acquaintance of many noted Ṣūfis, such as 'Abd-ul-Qādir Jīlānī and Khwājah Quṭb-ud-Dīn Bakhtiyār Kākī, who became one of his disciples. Finally, his travels brought him back to Herat, Balkh and Ghazni, from whence he came in A.D. 1192 to Delhi, where he stayed for a time. At the age of fifty-two, in the year A.D. 1195, he went to Ajmīr, which henceforth became his permanent residence, until his death in A.D. 1236. Titus, *Indian Islam*, Oxford University Press, 1930, p. 118.

<sup>3</sup> See Irvine, *The Army of Indian Moghuls*, p. 37.

Holy Prophet in a dream gave vent to his yearnings. In Rajab 1150 A.H. (1737 A.D.) he stealthily left his home one day bound for the sacred place on foot. Three days later when the secret leaked out, Āzād's brother Sayyid Ghulām Hasan himself undertook a journey to search his brother but returned home disappointed. Āzād had adopted a different route in order to avoid being traced and undergoing the terrible ordeals of the journey came to a place called Saronj in Mālwa. His feet had badly swollen and he was unable to walk. Nawāb Āsaf Jāh of Deccan was then engaged in a war<sup>1</sup> with the Mahrattas on the border of Mālwa. One of the nobles of the Nawāb took pity on Āzād and entertained him in his place as a guest until his recovery. Āzād presented himself on 22nd Sha'bān before the Nawāb and recited the following quatrain in his eulogy seeking his help in the sacred mission :—

ای حامی دین و محیط جود و احسان  
حق داد ترا خطاب آصف شایان  
او تخت بدرگاه سلیمان آورد  
تو آل نبی را بدر کعبه رسان

‘O Protector of Religion and Ocean of generosity and benevolence,

God has justly conferred upon you the title of Āsaf,

Āsaf brought the throne<sup>2</sup> in the Court of Solomon,

You convey the descendant of the Prophet (meaning himself) to the door of Ka'ba.’

The Nawāb was highly pleased with him and enlisted him in the army. Āzād fought valiantly and on the termination of the battle at the end of Ramadān, was given a sum of money by the Nawāb for the expenses of the journey to Mecca. He left Bhopal in the beginning of the month of Shawwāl and reached the port of Sūrat on the 10th Dhū'l Qa'da. On the 24th of the same month he embarked on a ship bound for Jedda and reached there on the 18th Muḥarram 1151 A.H. (1738 A.D.). Muḥammad Fākhir Ilāhābādī<sup>3</sup> poetically known as ‘Zā'ir’ who was then at Jedda received him at the port and Āzād was much pleased at the

<sup>1</sup> For details of this war see *Khizāna 'Āmira*, pp. 35–49.

<sup>2</sup> Āsaf is the name of Solomon's grand wazīr. By invoking the great name of God, he, in a twinkling brought before Solomon the throne of Bilqīs (the Queen of Sheba) from Sheba a two months' journey.

<sup>3</sup> Muḥammad Fākhir Ilāhābādī has mentioned Mawlānā Muḥammad Hayāt as-Sindī al-Madani in the list of his teachers in the preface to his work *Durrat at-Tahqiq fī Nuṣrat as-Ṣiddiq*. He was an eminent scholar and a poet also. His nom-de-plume was ‘Zā'ir’. He died in 1164 A.H. See *Rāmpūr Cat.*, vol. II, p. 595.

hospitality and courtesy of his host. He came to Mecca on the 23rd Muharram. As the time of pilgrimage had passed away, Āzād left for Madina on the 26th Muharram and reached there on the 25th Šafar just after one month. Āzād was then 35 years old. There Āzād paid his respects to ash-Shaikh Muhammad Hayāt as-Sindi al-Madani<sup>1</sup> who had migrated to Madina and settled there, and studied Hadīth under him. On the 14th Shawwāl 1151 A.H. (1738 A.D.) Āzād set out for pilgrimage and reached Mecca on the 26th Shawwāl. After performing the pilgrimage he read Hadīth again from Ash-Shaikh ‘Abd al-Wahhāb at-Ṭanṭāwī.<sup>2</sup> He stood high in the favour of the Shaikh who amused in passing his leisure-hours listening to his poetry. He appreciated it much and dwelling on the meaning of the word ‘Āzād’ remarked, “you are an emancipated slave of God”.

Āzād, next visited the famous shrines in Ṭā’if and reached Jedda in the end of Rabi’ II, 1152 A.H. (1739 A.D.). On the 3rd Jumāda I, he boarded a ship and landed at Mukhā, where he paid a visit to the famous shrine of ash-Shaikh ash-Shādhili.<sup>3</sup> On the 29th Jumāda I, he reached Sūrat and after a brief stay there for 5 months started for Deccan. On the 27th Dhū’l Qa’da, 1152 A.H. (1739 A.D.) he arrived at Aurangābād and led a retired life at the shrine of Bābā Shāh<sup>4</sup> Musāfir Naqshbandi for some time. He then made extensive tours on foot in the different parts of Deccan and visited the holy shrines and historical places of the country.

Āzād was really an independent man in the true sense of the term. Nawāb Nizām ad-Dawla Nāsir Jang<sup>5</sup> the son of Nawāb Āsaf Jāh had great regard for him and was on very friendly terms with him. When he ascended the throne of Deccan, Āzād’s friends requested him not to lose the opportunity and insisted that he should demand some high post from the Nawāb. Āzād retorted that he was free from the world and its desires and so could no more be the slave of any man. The world, he added, is like the river of Tālūt<sup>6</sup> (Saul) and a draught out of the hand is lawful and more than that is forbidden.

<sup>1</sup> Muhammad Hayāt as-Sindi al-Madani died in 1163 A.H. (1749 A.D.). See *Ma’āthir al-Kirām*, p. 164.

<sup>2</sup> ‘Abd al-Wahhāb at-Ṭanṭāwī, died 1157 A.H. (1744 A.D.). See *Ma’āthir al-Kirām*, p. 162.

<sup>3</sup> Ash-Shaikh ash-Shādhili was a great Ṣūfi and died 654 A.H. (1256 A.D.). See *Nafuḥāt al-Uns*, p. 663.

<sup>4</sup> Bābā Shāh Musāfir Naqshbandi died in 1126 A.H. (1714 A.D.). See *Ma’āthir al-Kirām*, p. 174.

<sup>5</sup> For detail accounts of Nawāb Nizām ad-Dawla, see *Khizāna ‘Āmira*, pp. 54-56.

<sup>6</sup> It refers to the verses of the Qur’ān and the translation is as follows :—

‘And then Talut departed with his soldiers, he said, Verily God will prove you by the river: for he who drinketh thereof, shall

He dedicated the last part of his life to teaching and writing books. He died in 1200 A.H.<sup>1</sup> (1785 A.D.) and was buried at Aurangābād, Deccan.

Āzād was an erudite scholar, well-versed in numerous branches of learning. His literary achievements won for him the celebrated appellation of *Ḥassān al-Hind*.<sup>2</sup> As a scholar and linguist he acquired a fame which few people can attain and had command over Arabic, Persian, Sanskrit, Urdu, and Hindī. His literary activities marked for profundity and elucidity cover a wide field ranging over Ḥadīth, literature, history, poetry and biography. The following is a list of his works :—

#### ARABIC WORKS.

##### (1) *Ḍaw' ad-Darārī Sharḥ Ṣaḥīḥ al-Bukhārī*.

It is a commentary in Arabic language on the famous work on Ḥadīth by al-Bukhārī (d. A.H. 256, A.D. 870). The commentator did not survive to complete the book and wrote up to *Kitāb az-Zakāt* of the original work. It is chiefly based on al-Qaṣṭallānī's (d. 923 A.H., 1517 A.D.) commentary called *Irshād as-Sārī*.

*Subḥat al-Marjān*, p. 122, Ṣiddīq Ḥasan, *Ithāf an-Nubalā'*, pp. 56, 107 and *Ḥadā'iq al-Ḥanafīya*, p. 455.

##### (2) *Dīwān Āzād*.

It is a collection of poems in Arabic arranged in alphabetical order.

*Hyderabad Cat.* (1900) No. 109, p. 14, *Rāmpūr Cat.*, vol. I, p. 586, and *Subḥat al-Marjān*, p. 122.

##### (3) *Mazḥar al-Barakāt*.

It is a collection of Arabic poems in the metre of *Mathnavī*. *Mathnavī*<sup>3</sup> is a form of poetry in which each *bait* (verse) is nor-

not be on my side (but he who shall not taste thereof he shall be on my side) except he who drinketh a draught out of his hand. Sale, *Translation of the Koran*, printed by S. Hazard, 1795, p. 46.

<sup>1</sup> According to poet Jauhar, who, as stated in Rieu, p. 373, saw Āzād in Aurangābād, 1198 A.H., 1783 A.D., Āzād died in 1199 A.H., 1784 A.D.; but several other biographers record his death in 1200 A.H., 1785 A.D. Abdul Muqtadir, *Bankipore Cat.*, vol. III, p. 253.

<sup>2</sup> *Ḥassān al-Hind* is the title given to Āzād Bilgrāmī by his contemporary scholars in imitation of Khāqānī's (d. 595 A.H., 1198 A.D.), epithet *Ḥassān al-'Ajam*. Ḥassān bin Thābit used to recite poems before the Prophet and was the founder of the religious Islamic poetry. He was the most eminent poet of his age and the Prophet appreciated his poetry. As a result of the encouragement given to Ḥassān by the Prophet and his praise of him as a great genius, the association of the epithet 'Ḥassān' with any name, was regarded as the greatest honour which a poet can ever attain.

<sup>3</sup> *Encyclopædia of Islām*, No. 43, p. 410.

mally a self-contained whole, grammatically complete and with two *Miṣrā's* (hemistiches) rhyming with one another and not—except accidentally—with the verses that follow. In Persian and Urdū, poetic compositions of any length dealing with epic, romantic, ethical or didactic themes are of the *Mathnavi* form. Arabic contains no poems of the *Mathnavi genre*, but poems having the two *Miṣrā's* of each *bait* rhyming together independently of the rest are known. The arrangement of the rhyme is known as *Muzdawija*. Short specimens translated from Persian are quoted in *Tha'ālibi's Yatimat ad-Dahr* (IV, 23), and there are longer compositions, metrical grammars, by Hariri (*Muḥat al-I'rāb*) and by Muḥammad bin Mālik (*Kitāb al-Ālfiya*). Āzād introduced this into Arabic poetry and wrote seven *Mathnavis* which he called by the above title *Maẓhar al-Barakāt*.

Houtsma, *Cat.* No. 91, *Ithāf an-Nubalā'*, p. 331, and *Ḥadā'iq al-Ḥanafīya*, p. 455.

(4) *Mir'at al-Jamāl*.

It is an Arabic poem containing 105 verses and describing the beauties of a beloved from head to foot.

*Ithāf an-Nubalā'*, p. 331, and *Ḥadā'iq al-Ḥanafīya*, p. 455.

(5) *Tasliyat al-Fu'ād fī Qaṣā'id Āzād*.

It is an anthology of some of his Arabic *Qaṣīdas* (encomiums).

*Ḥadā'iq al-Ḥanafīya*, p. 455 and *Subḥat al-Marjān*, p. 122.

(6) *As-Sab'at as-Sayyāra*.

It is a collection of seven Arabic *Diwāns*. In these *Diwāns* there is a large number of poems in praise of the Prophet. An autograph copy of this work is preserved in the Library of Nawāb Nūr al-Hasan at Lucknow. The author commenced the work in 1179 A.H., 1765 A.D., and finished it in 1194 A.H., 1780 A.D. See Ḥāfiẓ Nazīr Aḥmad, *Descriptive Notes on Libraries, Journal, Asiatic Society of Bengal*, New Series, vol. XIII, 1917, No. 2, p. cxxxix, No. 152.

*Ḥadā'iq al-Ḥanafīya*, p. 455 and *Ithāf an-Nubalā'*, p. 331.

(7) *Shamāmat al-'Anbar fī mā warada fī'l Hind min Sayyid al-Bashar*.

In this work the author collected all the Sayings of the Prophet relevant to India.

*Hyderabad Cat.*, vol. III, Nos. 853, 857, 859, p. 258.

(8) *Shifā' al-'Alīl fī Iṣṭilāḥāt Kalām Abī'ṭ Ṭayyib al-Mutanabbī*.

In this work the peculiar phraseologies which one comes across in the poetry of al-Mutanabbī (d. 354 A.H., 965 A.D.) have been explained. His ardour for pro-Arab feelings and his metaphors and ingenious similes are also discussed.

*Ḥadā'iq al-Ḥanafīya*, p. 455 and *Ithāf an-Nubalā'*, p. 331.

A copy of this work is in M. 'Alī Husain's Library, Kūchah-i-Madrasah-i-A'izzah, Hyderabad, Deccan. *Journal, Asiatic Society of Bengal*, vol. XIII, 1917, No. 2, p. cxxiii, No. 101, where it is called *Shifā' al-'Alīl fī Iṣlāḥ Kalām al-Mutanabbī*.

(9) *Subḥat al-Marjān fī Āthār Hindūstān*.

In this book the author dwells on four different subjects. *Firstly* he mentions the Hadīths (Sayings of the Prophet) and commentaries of the Qur'ān that describe the superiority of India; *secondly* he gives short biographies of some of the great scholars of India; *thirdly* he dwells on the excellent and rare similes and metaphors of Hindī language which he introduced into his Arabic poetry with an excellence which elicits admiration and applause. His contemporaries sought to follow him on the same lines but met with little success; *fourthly* there is a discourse between a lover and a beloved. In this last chapter the author enumerates the different kinds of women classifying them by Hindī as well as appropriate Arabic names. It was compiled, 1177 A.H.

*Ithāf an-Nubalā'*, p. 331 and *Ḥadā'iq al-Ḥanafīya*, p. 455.

It was lithographed in Bombay, 1303 A.H.

It was translated into Persian language by Sayyid Shams ad-Dīn Hasanī al-Husainī Banāresi.

From the note at the end of the translation it transpires that the translator was in the service of Mahārāja Isarī Parshād (Rāja of Banāres) in 1869, at whose order the translation was made. He was a pupil of his uncle 'Abdallāh Banāresi and was buried by the side of his father Shāh Wārith 'Alī.

See Abdul Muqtadir, *Bankipore Cat.*, vol. VIII, p. 7.

#### PERSIAN WORKS.

(1) *Dīwān-i-Āzād*.

It is an anthology of lyrical poems in Persian and the Ghazals are arranged in alphabetical order. A few *rubā'īs* and *tārikhāt* are at the end.

Ethé, *India Office Cat.*, No. 1722, Sprenger, *Cat.*, p. 364 and *Bankipore Cat.*, vol. III, p. 252.

Lithographed, Hyderabad, 1301 A.H. See *Hyderabad Cat.*, vol. III, No. 830, p. 288.

(2) *Ghizlān al-Hind*.

In this work the metaphors and similes of Hindī language are explained and introduced into Persian science of metaphors ('*Ilm al-Badī'*). There are also descriptions of different kinds of women, as classified in Hindī, for the knowledge of Persian students. It is practically a Persian version of *Subḥat al-Marjān*.

Pertsch, *Berlin Cat.*, No. 1051, p. 1001 and Ethé, *India Office Cat.*, No. 1722. Also a copy of this book is in M. 'Alī



Husain's Library, Hyderabad, Deccan. *Journal, Asiatic Society of Bengal*, New Series, vol. XIV, 1918, No. 8, p. cccliii, No. 310.

(3) *Khizāna-i-‘Āmira*.

It is a well-known and valuable *tadhkira* or memoirs of ancient and modern Persian poets. The author wrote this work in Persian in compliance with the wishes of his brother's son Mir Aulād Muḥammad, who requested him, 1176 A.H. (1762 A.D.), to compile the lives of those poets who had amassed wealth by praising the great men. To this Āzād assented with a view to giving a distinctive character to this *tadhkira*, although, he adds, he never had stooped to lauding any one for the sake of money. It is alphabetically arranged and contains the biographies of 135 poets (see for these names, Ethé, *Bodl. Cat.*, No. 381, pp. 256-260).

*Journal of the Royal Asiatic Society*, vol. IX, pp. 150-153 ; Rieu, *Persian Cat.*, p. 373, where a full list of Āzād's authorities is given ; Elliot, *History of India*, vol. VIII, p. 188, Ethé, *India Office Cat.*, No. 685 ; Ivanow, *Cat., Asiatic Society of Bengal* No. 232 ; Sprenger *Oudh Cat.*, p. 143, and Abdul Muqtadir, *Bankipore Cat.*, vol. VIII, p. 127.

Lithographed, Cawnpore, 1900 A.D.

(4) *Ma'āthir al-Kirām Tārīkh Bilgrām*.

It is the *first volume* of the great biographical work on the famous men of Bilgrām and other eminent persons who were in some way or other connected with it. It is divided into two *fasls* (parts), the first dealing with pious men, the second with learned men. There are eighty biographies in the former, and seventy-three in the latter. The author mentions himself in both the parts. It was completed in 1166 A.H., 1753 A.D.

Ethé, *India Office Cat.*, No. 682 ; Rieu, *Persian Cat.*, vol. III, p. 971 ; Pertsch, *Berlin Cat.*, pp. 566-569, and Abdul Muqtadir, *Bankipore Cat.*, vol. VIII, p. 166.

Lithographed, Agra, 1910.

Ghulām Ḥasan Siddiqī Farshūrī Bilgrāmī (Circa 1178 A.H., 1765 A.D.) has written a criticism of this work under the title *Sharā'if 'Uthmānī*. Apparently some personal feeling constituted the chief reason for this work. Ivanow, *Cat., Asiatic Society of Bengal*, vol. I, No. 277, p. 116.

(5) *Ma'āthir al-Umarā'*.

It is a well-known biographical dictionary of the *wazīrs*, high officials and noblemen, who were associated with the dynasty of the Indian Timurides. The work was written by Ṣamsām ad-Dawla Shāh Nawāz Khan Khwāfi Aurangābādī whose real name was Mir 'Abd ar-Razzāq (d. 1171 A.H., 1758 A.D.). These original sketches were arranged and finally compiled by

our author who added an introduction and a biography of Shāh Nawāz K̤han. Full accounts of the work will be found in Morley's *Cat.*, p. 101 and Elliot's *History*, vol. VIII, pp. 187-191.

Rieu, *Br. Mus. Cat.*, vol. I, p. 339; Ethé, *Bodl. Cat.*, No. 166; Ethé, *India Office Cat.*, No. 622; Blochet, *Cat. Bib. Nationale*, vol. I, No. 639 and Ivanow, *Cat.*, *Asiatic Society of Bengal*, p. 69.

It was published in the *Bibliotheca Indica Series*, 1887-1895, and translated into English by H. Beveridge (the same series, 1911, and onward in progress).

(6) *Rawḍat al-Awliyā'*.

It is a short compendium on the great saints of India, specially of the Dakhan. The first biography is that of Shaikh Burhān ad-Dīn Muḥammad bin Maḥmūd bin Nāṣir, commonly called al-Gharib al-Hānsawī.

Ethé, *India Office Cat.*, No. 655.

Lithographed, A.H. 1310, *Hyderabad Cat.* (1900), No. 74, p. 10.

(7) *Sand as-Sa'ādāt fī Husn Khātimat as-Sādāt*.

In this treatise the author has proved from the Sayings of the Prophet and other eminent scholars that the end of the descendants of the Prophet is bound to be good and their entrance into Paradise is sure. This was also the view of some of the eminent authors who preceded him. Muḥī ad-Dīn Ibn al-'Arabī (d. 638 A.H., 1240 A.D.) in his famous work *al-Futūḥāt al-Makkiya*, chapter 29, stated that all the descendants of Fāṭima, the daughter of the Prophet, have received 'glad tidings' and their entrance into Paradise has been foretold. Ibn Hajar al-Haitamī (d. 973 A.H., 1565 A.D.) in *as-Sawā'iq al-Muḥriqa* and al-Qāḍī Shihāb ad-Dīn Dawlatābādī (d. 849 A.H., 1445 A.D.) in *Manāqib as-Sādāt* have also expressed the same view.

*Ma'āthir al-Kirām*, p. 59; Rieu *Cat.* vol. III, p. 978a, and *Ḥadā'iq*, p. 455.

(8) *Sarr-i-Āzād*.

It is the *second volume* of the biographical work on the famous poets of Bilgrām and other parts of India who lived after 1000 A.H.. In the preface the author says that after having completed in 1148 A.H. (1735 A.D.), his general *tadhkira* of Persian poets styled *Yad Baidā*, he resolved upon writing a work on the literary men of his native town, which he divided into two volumes; the first he styled *Ma'āthir al-Kirām* and the second *Sarr-i-Āzād*.

It is divided like the first volume into two *faṣls* (parts), the first comprising 143 biographies of Persian poets, the second

eight biographies of Hindi poets. It was composed in 1166 A.H., 1752 A.D.

Ethé, *India Office Cat.*, No. 683; Ivanow, *Asiatic Society Cat.* (Curzon Collection), p. 63; *Ibid.*, *First Supp.*, p. 7; Sprenger, *Cat.* p. 143; Abdul Muqtadir, *Bankipore Cat.*, vol. VIII, p. 123, and *Journal, Royal Asiatic Society*, vol. IX, p. 170.

An autograph copy of the work is in Hakīm 'Abd al-Hayy's Library, Aminābād, Lucknow. Hāfiẓ Naẓīr Aḥmad, *Descriptive Notes on Libraries, Journal, Asiatic Society of Bengal*, New Series, vol. XIV, 1918, No. 8, p. cclviii, No. 86.

Lithographed, 1913. See *Hyderabad Cat.*, vol. III, p. 164.

Muḥammad Ṣādiq bin Muḥammad Aḥsanallāh Bilgrāmī sur-named 'Sukhanwar' has written a criticism of this work under the title *Taḥqīq as-Sadād fī Maḍhallat al-Āzād*. It is not the historical trustworthiness of the work which is attacked, but the style and the poetry of Āzād are subjected to criticism. Muḥammad Ṣādiq was greatly displeased on finding in this book of Āzād only a brief note on himself with a quotation of a few of his verses. In revenge he pours the worst invective upon Āzād without any sense of measure or prospective. Composed soon after 1167 A.H., 1753 A.D. 'Abd al-Qādir Samarqandī Dihlawī, a partisan of Āzād, wrote a reply under the title *Ta'dīb az-Zindīq fī Takḍīb aṣ-Ṣiddīq* to the above-mentioned abusive criticism of Muḥammad Ṣādiq. The tone of the reply is more sober and reasonable and the author tries to prove the falsity of the accusations. Composed apparently shortly after the preceding work. Ivanow, *Cat. Asiatic Society of Bengal*, vol. I, Nos. 397 and 398, p. 172.

#### (9) *Yad-i-Baidā*.

A biographical work of ancient and modern Persian poets, arranged in alphabetical order.

The author gives a detailed account of his life at the end of this work. He tells us that, during his four years' stay in Siwistān, he devoted most of his time to the study of historical and poetical works. He made selections from the poetical works of ancient and modern poets, and compiled a *Tadhkira* in 1145 A.H., 1732 A.D., entitling it *Yad-i-Baidā*. This work received a wide circulation. Subsequently, when he came to Ilāhābād, he obtained fresh materials for the work, and prepared an improved addition in 1148 A.H., 1735 A.D. The author proceeds to say that, two years later, he went on a pilgrimage to the holy places of Mecca and Madīna; and on his way back, while he was staying at Aurangābād, he received a letter on the 4th Ramadān, 1153 A.H., 1740 A.D., from Mīr Muḥammad Yūsuf of Bilgrām, stating that during his absence from India a certain inhabitant of Banāres (name not given), after removing the author's name from the *Tadhkira*, had circulated it as his own, and had distributed copies of it in several places. The author remarks

that anecdotes and sayings in the work, derived from rare compositions, had been boldly appropriated as his own by this 'Banāresi thief', as if the latter had written the *Tadhkira* after collecting the facts for himself. 'But', he adds, 'his blind eyes could never obtain a view of those rare compositions'.

The author adds that, after his return from pilgrimage, he collected some more materials, which he sent to some of his esteemed friends for insertion in the *Tadhkira*.

The preface ends with a short history of the origin of Persian poetry.

According to Sprenger, *Oudh Catalogue*, p. 142, the work contains 532 biographies. The first poet mentioned here is Afdal ad Din Muḥammad Kāshānī, and the last, Mir Muḥammad Yūsuf bin Mir Muḥammad Ashraf.

*Journal of the Royal Asiatic Society*, vol. IX, p. 170; Abdul Muqtadir, *Bankipore Cat.*, vol. VIII, p. 115, where it is stated that pp. 160-222 are in the handwriting of the author; and *Hyderabad Cat.*, vol. III (A.H. 1347), Nos. 155, 186, p. 162, where it is also called *Tadhkira Subḥ Khandān*. Another copy of this work comprising 225 folios is preserved in the collection of the descendants of Sayyid as-Sādāt Burhān ad-Dīn of Samdan, a village in U.P. The MS. is valuable as it was copied at the instance of Āzād's father, Sayyid Nūḥ al-Ḥusainī, and is in the handwriting of Āzād and his two brothers Ghulām Ḥasan and Ghulām Imām Šādiq.

*Muslim Review*, Calcutta, vol. I, No. 2, 1926, pp. 35 and 36.

N. Bland in the *Journal of the Royal Asiatic Society*, vol. IX, p. 153 wrongly places *Nāz wa Niyāz* (a love-tale of Prince Niyāz and Princess Nāz, a Sufistic allegory in Persian Mathnavī rhyme) in the list of the compositions of Āzād Bilgrāmī. From the preface of the said work it appears that the writer was for a short time in attendance on Muḥammad A'zam Shāh, died in 1119 A.H., 1707 A.D., and that the latter was a patron of the poet. As Āzād Bilgrāmī was born in 1116 A.H., 1704 A.D., it is clear that the said work was not compiled by him.

The real author of *Nāz wa Niyāz* is Mirzā Anjuman 'Āzād', son of the Kashmirian poet 'Abd al-Ghanī Beg 'Qabūl' (died in 1139 A.H. 1726 A.D.). He has also written *Dilkushā Nāma*, the history of Mukhtār, the avenger of Imām Ḥusain bin 'Alī, a Shī'a legend, in Mathnavī rhyme, and has completed the unfinished work of Mirzā Muḥammad Rafī' 'Bādhi's' (died 1123 or 1124 A.H.) *Ḥamla-i-Haidarī*.

Rieu, *Cat.* vols. II, pp. 704, 712, 719, and III, p. 1091.

## URDŪ WORK.

### *Billī Nāma*.

It is a very interesting story of a cat who spent her life in feasting on rats and then went on pilgrimage to atone for her

sins though she would not mend her ways. The story serves as an advice to men to be on guard against deceiving people who are by nature wicked. The characters chosen for it are animals as in the case of the books of the same *genre*, *Kalīla wa Dimna*, etc. It is one of the best pieces of Urdū literature dating from 150 years back.

Lithographed on the margin of *Chūhai Nāma* (the Book of Rat) by the poet Iram, in Nawal Kishore Press, Cawnpore, A.D. 1871; and also by Khidr Bānū Ṣāhibā Khairī in 'Ālamgīr (Yearly Number), 1935, pp. 129-134.

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4. *Ithāf an-Nubalā'* by Ṣiddiq Ḥasan, p. 330.
5. *Ḥadā'iq al-Ḥanafīya* by Faqīr Muḥammad, p. 454.
6. Khidr Bānū Ṣāhibā Khairī, 'Ālamgīr, Lahore, 1935, pp. 170-72.
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11. Blochet, *Cat. Paris*, vol. II, p. 326.
12. *Muslim Review*, Calcutta, vol. I, No. 2, 1926, pp. 25-36.
13. *Gul-i-Ra'na*, foll. 3b-21b.

# Numismatic Supplement for 1935-36

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[*Journal of the Royal Asiatic Society of Bengal. Letters*]



# Numismatic Supplement No. XLVI

[for 1935-36]

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## NUMISMATIC SUPPLEMENT No. XLVI

### ARTICLES 328-340

*Continued from 'Journal and Proceedings', Vol. XXX,  
New Series, No. 3.*

#### 328. SOME COINS OF THE NAPKI MALKA CLASS RESTRUCK BY SHAHI-TIGIN.

Coins of Shahi-tigin are well-known both for their extraordinary trilingual legends and for their unusual design. Among the more readily available illustrations I would cite Cunningham, 'Coins of the Later Indo-Scythians', Pl. X, No. 9, and Vincent Smith, 'Indian Museum Catalogue, Vol. I, Pl. XXV, 1. The obverse portrait is a three-quarter face,—an unusual representation, and the reverse design is a bust of a male deity, possibly the sun-god, to front with flames springing from behind the head and rising to a point.

The findspots of the Shahi-tigin Coins have been carefully recorded by Cunningham (in *Num. Chron.*, 1893, page 268) as follows :—

'Two specimens were obtained by Ventura in the Manikyala Stupa. Dr. Lord got forty to the north of the Caucasus (i.e. Hindukush). I have received some twenty or thirty from Kabul, and I am aware that a few have been found in Sindh and Kacch.'

The latter, presumably, are strays—perhaps brought down through Kandahar, Quetta and Shikarpur, the well-known Sindh entrepot for Central Asian trade—and the seat of Shahi-tigin's power should, therefore, be searched for in Northern Afghanistan and not in Multan as erroneously supposed by Cunningham. Dr. Heinrich Junker has made a recent study of the coin legends on these and similar coins, in 'Die Hephthalitischen Münzschriften' (Berlin, 1931), and has found an interesting series of place-names. Those on the coins showing the sun-god are specially important :—

Dāwar (Zamindāwar) on Cunn. X, 9 and 10

Rōšnān (?Rudbar on Helmand) on X, 9 and 11

Zābulistān on X, 9 and 10

Farzān (?Idrisī Firoz and on Helmand) on X, 10

and Sakāwand (between Ghazni and Kābul) on X, 11.

This is sufficient indication for the geographical position of the shrine of the sun-god but the findspots of the coins of Shahi-

tiḡin suggest a more Northerly position for the centre of his power.

The coins showing this full-face bust of the sun-god can be dated with great accuracy, as two of these issues were struck by Khusrau II of Persia and dated in years 26 and 37 of his reign, corresponding to 616 and 627 A.D.

We have fortunately an invaluable document describing Afghanistan at this period in the *Life and Travels of Yuan Chwang*, the Chinese Buddhist pilgrim whose travels lasted from 629 to 645 A.D. and who passed twice through Afghanistan. Reference to his writings makes it fairly certain that Shahi-tiḡin was the King of Kapisi, an area north-east of Kabul, and that the sun-god was 'Shuna' or 'Ch'una' whose shrine was on a mountain in the south of the Tsao-ku-ta country, roughly in the neighbourhood of Zamindāwar and Kandahar.

Watters, in his edition of *Yuan Chwang*, states :—

'Our pilgrim reports this god as being held in great awe, as having rich offerings presented to him and prayers made to him, not only by the inhabitants of Tsao-kuta, but also by votaries of all classes from other countries.'

The great diversity of style and script on coins bearing this bust indicate that the deity portrayed was of more than local or provincial importance, and, as Cunningham's suggestion that it was the sun-god of Multan has been discredited, I have no hesitation in putting forward this alternative proposal. He was, apparently, a Turkish god whose cult was imported from Central Asia by the Western Turks who ruled in various portions of Afghanistan from 567 A.D. to 658 A.D. when they were absorbed in the Chinese Empire. Watters states that Shuna was a sun-god and the bust on the coins is unmistakably that of a solar diety. Yuan Chwang tells us a curious story of how, when this god was travelling from Central Asia to Tsao-ku-ta, he wished to halt in the kingdom of Kapisi, but, the guardian spirit of Mount Aruna proved inhospitable and was punished by having to do annual obeisance to Shuna in his new home (see Watters, pp. 126-7).

We, therefore, find in this legend a direct connection between Shuna and the kingdom of Kapisi, which, considered in conjunction with the coin findspots, make it probable that Shahi-tiḡin was ruler of Kapisi.

This probability is strengthened by the fact that General Ventura obtained two of these coins from the relic chamber of Manikyala stupa near Rawalpindi. The king of Kapisi at the time of Yuan Chwang's travels was a great conquerer, but had recently lost Taxila to the Kingdom of Kashmir. The coins must have been deposited at Manikyāla before this change of rule.

Further statements by Yuan Chwang show that this king was ruling over the following areas at the time of his visit :—

- (1) Kapisi—which according to Watters and Cunningham must have then included the whole of Kafiristan as well as the two large valleys of Ghorband and Panjshir.
- (2) Nagar—the district round Jalālabad.
- (3) Gandhāra—west of the Indus, corresponding to Peshawar Dist.
- (4) Varna—which Sir Aurel Stein has proved to be Bannu Dist., as previously conjectured by Cunningham.
- (5) It appears from Yuan Chwang's 'Life' that Tsau-kuta may also have been included in his empire, but this is by no means certain.

Having fixed Shahi-tigin both in time and place I am now able to publish three countermarked coins which have not been previously ascribed to him.

These coins were struck, prior to the period of their counter-marking, by one of Napki Malik's later successors who probably lived in the Kabul area, or perhaps further north as, prior to the invasions of the Western Turks, the Greek Kushan script which is found on these coins appears to have been almost totally confined to the countries north of the Hindukush.

The legend on these coins has been read by both Herzfeld and Junker as 'Sri Shahi'. Turning now to the countermarks, two of my coins have a countermark containing two Brahmi characters and are, therefore, duplicates of Cunningham, 'Later Indo-Scythians', plate IX, 19. Cunningham read these as 'Tiri', but a closer study shows them to be 'Tigi'. I am indebted to this discovery to Mr. Majumdar, who at once agreed with my suggestion that this was short for 'Tigin', a common title for a chieftain among the Turks. Cunningham mentions having 'three similar coins with an insect as countermark' and these two show this as an additional mark. My third has it as a sole countermark. On a close study, however, I cannot agree with Cunningham in calling it an insect. It is a facing bust of the sun-god Shuna!

We have now two clues pointing to the Turkish origin of these countermarks—the bust of Shuna and the title Tigin. Further, the use of Greek-Kushan legend on the coins before this being countermarked points to the neighbourhood of Kapisi as their provenance. We should, therefore, compare the coins with those of Shahi-tigin, the Turkish ruler of Kapisi. Both have the Greek-Kushan legend 'Sri Shahi' in front of the face on the obverse (perhaps Shahi-tigin copied this from the late Napki-Malka coins), both have the bust of the sun-god, and

while one class has 'Shahi-tigīn' in the long Brahmi legend, the other contains 'Tigīn' as a countermark.

Finally, and for this finishing touch to the argument I am indebted to Mr. Dikshit, two minute Brahmi letters, which appear in the same oval countermark as the bust of the sun-god, can only be read as 'Shahi'. This, with the 'Tigīn' countermark completes the name 'Shahi-tigīn' on the countermarked coins.

Baladhuri tells us a curious story in his description of the campaign of A.H. 33 (=653 A.D.) in which Ibn-Samurah, governor of Sijistan, over-ran Zamindāwar :—

'When he got as far as the provinces of ad-Dawar he surrounded the enemy in the mountain of Az-Zur. They soon surrendered to him . . . . . Ibn-Samurah went into the temple of the Zur, an idol of gold with two rubies for eyes, and cut off the hand and took out the rubies. Then he said to the Satrap, "Keep the gold and the gems. I only wanted to show you that it had no power to harm or help."'

It appears that this idol is the Shuna of Yuan Chwang and the sun-god of our coins. Shuna lived on a mountain in the south of the Tsao-ku-ta country (which included the Helmand Valley and the country from Ghazni to Kandahār). The idol mutilated by Ibn-Samurah, was on a mountain in the neighbourhood of Zamindāwar, and the rubies and gold of the idol indicate by their brightness that his may have been a solar cult.

Though the Western Turks first appeared on the Iranian borderlands between 563 and 567 A.D. they did not advance to Herāt till 588 A.D. and a general of Khusrāu II was able to force his way as far as Balkh as late as 597 A.D. It appears therefore that they did not establish themselves round Kābul, Ghazni and Kandahār; and there is nothing improbable in the theory that Shahi-tigīn was among the first to rule in this area and that it was he who imported the god Shuna and established him in Zamindāwar.

M. F. C. MARTIN.

### 329. THE COINS OF RAJGIR.

In this paper my object is to illustrate some cast and single-die copper coins originally hailing from Rajgir, and now in two private collections. Mr. Prithwi Singh Nahar the well-known coin collector of Calcutta owns Nos. 2, 4, 5, 6, 9 and 11 while the rest belong to me. I am grateful to Mr. Nahar for placing his coins at my disposal. Cast coins of the type of No. 1 have long been known and were first described by Cunningham. They are also found at other sites, but as they are found in particularly large numbers at Rajgir I thought it best to include them under 'THE COINS OF RAJGIR'. Early cast and die-struck coins were widely prevalent throughout North India and had many features in common. The so-called Taxilā and Ujjain symbols were not confined to coins originating from these cities, but were well recognized symbols throughout India.

In spite of the existence of this community of symbols, each provincial currency in ancient India had its own characteristics and local peculiarities noticeable in the fabric of the coins, as also in the grouping of the symbols. The symbols play a very important role in the assignment and interpretation of Ancient Indian Coins, including punchmarked as well as cast and die-struck coins. These symbols have from the very beginning exercised eminent numismatists such as Cunningham, Theobold, Rapson, and V. A. Smith, who have arrived at different conclusions as to their interpretations. Here I wish to add a few remarks about the so-called 'sq. cross' and the 'triangular-headed' symbol.

The square cross is almost invariably present in all the cast coins from Rajgir and has been explained by Theobold as 'a variant of Swastikā'. Apart from its very close association with the coins of Rajgir, the symbol appears along with a three-arched *chaitya* in a coin from Taxilā.<sup>1</sup> In a two-*pana* piece from Taxilā it occupies the whole of the reverse.<sup>2</sup> Outside India a symbol similar to this has been found in an ancient tomb at Mycenæ.<sup>3</sup> It is very difficult to say what this symbol stands for. Theobold's Nos. 225 and 269 appear to have a very close connection.<sup>4</sup> Theobold would interpret No. 225 as a cross having within it a 'śaivite lotus'. The symbol within the cross appears to be a lotus but the compound symbol can be very appropriately explained as a tank or step well with four approaches and a lotus within.

<sup>1</sup> C.A.I. Pl. II, 16.

<sup>3</sup> J.A.S.B., 1890, p. 260.

<sup>2</sup> C.A.I. Pl. II, 15.

<sup>4</sup> *Ibid.*, Pl. XI.

The so-called 'triangular-headed' symbol is yet another mystery. According to Theobald, in whose article it is numbered 119, it is 'a raised receptacle of food for birds'. This symbol occurs singly on punchmarked, cast and die-struck coins. Sometimes it is also represented in a railing.<sup>1</sup> The antiquity of this symbol is proved from the fact that a gold leaf representation of it has been found among other relics from the famous Piprāhwā vase.<sup>2</sup> It also appears to be a Jaina symbol, appearing in an Āyagapaṭa of the 1st century A.D. from Mathurā.<sup>3</sup> A marked similarity exists between this symbol and another which appears on some coins of a king Suyamita of the so-called Pāñcāl a Mitra Dynasty, where a rayed sun surmounts this symbol making it as its stand.<sup>4</sup> That these two symbols represent one common object and serve a common purpose by holding a swastikā over them, is proved by the substitution of one for the other in some of the copper coins of the Kunindas. In the light of this evidence it will not be inadequate to interpret it as an altar. Curiously enough, while describing the coins of Suyamita, Rivett Carnac termed it to be a 'triangular-shaped altar'.<sup>5</sup>

A group of common symbols arranged in a particular order distinguish the cast coins from Rajgir. Generally the common symbols are, a tree in railing,<sup>6</sup> a three arched chaitya with a crescent, a square cross, a swastikā, a taurine, a triangular-headed symbol and an elephant. One or two of the above mentioned symbols are sometimes replaced by others and sometimes also the arrangement is different. The chief feature of these coins is the presence of an animal on one side and a tree in railing on the other (Pl. No. 1). The animal is generally an elephant, but a bull or a lion also occurs in rare instances. In some coins of this series (e.g. No. 2) animals, different or identical appear on both the sides.

No. 3 is another interesting coin widely differing from the ordinary type of cast coins from Rajgir. It has on one side a railing, enclosing a tree, with prong-shaped branches in two tiers, depicted just opposite to the manner in which they are found on the coins of the Kunindas. The tree here may be compared with that on some coins of the Saka satraps of Mathurā.<sup>7</sup> There is to the left of the tree, a wheel on a stand made up of two inclined spokes and an arc. Similar wheels on stands are

<sup>1</sup> J.R.A.S., 1900, p. 101.

<sup>2</sup> J.R.A.S., 1898, p. 596.

<sup>3</sup> Coomaraswamy—History of Indian and Indonesian Art, Pl. XIX, 71.

<sup>4</sup> J.A.S.B., 1880, p. 89, Pl. IX, 24.

<sup>5</sup> *Ibid.*

<sup>6</sup> Two distinct varieties of tree are found, one with three branches and another having more than three branches with foliage.

<sup>7</sup> C.A.I., Pl. VIII, Nos. 16, 17.

to be found in the famous reliefs of Bhārhut and Mathurā.<sup>1</sup> The wheel has a very close resemblance with similar wheels in a coin from Kosām<sup>2</sup> and in the only known coin of the Kulutas.<sup>3</sup> To the right of the tree, appear traces of another indistinct symbol. On the reverse occurs the 'Ujjain symbol' and an elephant standing to left with its trunk and tusk so clearly visible. The elephant here is much superior in execution to the representation of the animal elsewhere on the cast coins. As regards the so-called 'Ujjain symbol' Rapson agreed with Cunningham that this symbol occurs 'on nearly all the coins of ancient Malwa, wherever found—at Eran, Besnagar and Ujjain' and preferred to term it 'Mālava symbol'.<sup>4</sup> But this symbol also appears on several ancient Indian coins from places far beyond the limits of ancient Mālava, as for example on several coins of the Hindu satraps of Mathurā,<sup>5</sup> on coins of Kosām, and on the present coin from Rajgir.

The rectangular single-die coins from Rajgir which are comparatively rare conform to some definite types rather than exhibit a number of symbols regularly arranged as on the cast coins. Their style of execution is superior to that of the cast coins (cf. Nos. 4, 5 and 10).

No. 4 is a beautiful coin showing an ornamental border made up of fine leaves and a shallow incuse, two seated figures within. The one to the right (apparently a monkey) with its tail coiled up at the back extends the right hand to receive some object from the other figure to its left, which is apparently seated on a semi-circular stool with the legs hanging down. There are distinct traces of a head dress which may indicate the superiority of the figure to the left. The object which is being delivered closely resembles a lotus with a long stalk. The significance of the whole of this unique scene is unknown but it may be some well-known story from the Rāmāyana.

Another beautiful and unique coin is No. 5. Within an ornamental border made up of fine leaves and in a shallow incuse stands a symbol composed of four crescents round a central boss. A variant of this symbol is found in the famous reliefs of Bhārhut and another is the so-called 'Taxilā symbol'. Mr. V. A. Smith would describe it as 'solar symbol composed of crescents applied to a central boss'.<sup>6</sup> This symbol is numbered 161 in Theobald's article<sup>7</sup> where it has been described as 'four taurines united together in cuniform fashion'.

No. 6 has a border of ten taurines arranged along the edges with a single sickle-shaped symbol within, the significance of which is unknown.

1 Coomaraswamy—History of Indian and Indonesian Art, Pl. XIX, 71.

2 I.M.C., Pl. XX, 5.

4 J.R.A.S., 1900, p. 108.

6 I.M.C., p. 157n.

3 C.A.I., Pl. IV, 14.

5 I.H.Q., Vol. X, No. 4, p. 725.

7 J.A.S.B., 1890, Pl. X.



The next interesting group Nos. 7 and 8 show a three arched chaitya with a crescent and a taurine by the side. These symbols appear to have been struck on a blank field by means of a single-die containing both the symbols. The chief point of interest in respect of these coins are in the unusual way in which the symbols have been depicted.

No. 9 shows a beautiful representation of the *pipal* (*bodhi*) tree within a latticed railing on the upper edge of which are seen a bud (?) and *chaatra*. On either side of the tree is a *cruz ansata* and an inverted taurine.

No. 10 shows scales hanging from a taurine by means of a cord and a vertical bar standing to the left. The whole device is within a shallow incuse and has an ornamental border.

No. 11 is exactly similar but thinner and the vertical bar stands to the right instead of left of the scales. The association of the bar with the scale may perhaps be taken to represent a sceptre, but the scales as symbolising royal justice are not met with in ancient India. Mr. Jayaswal would like to explain the bar as Brāhmi 'ra'.

Most of the Rajgir coins do not conform to the indigenous weight system of India, unlike the single die coins from Taxilā which nearly always conform to that system. Finding that the Taxilā coins constantly maintain a weight of 140-144 grains Cunningham designated them as *payas*. Only three of the Rajgir coins agree to the indigenous standard in weight : viz. Nos. 1, 7 and 9 weighing respectively 68.8 grains, 34.5 grains and 14.6 grains. They may therefore be called *ardhapāṇa*, *Kākinī*, and *ardha-Kākinī* respectively.

As regards the age, the cast coins of India may be assigned to the 2nd and 1st centuries B.C. and 1st century A.D. Some of them have been found from the lowest stratum in course of excavation on the site of the New Rajagriha along with some stone fragments containing Brāhmi inscriptions assignable to the pre-Christian epoch.<sup>2</sup> According to Cunningham native copper coins were contemporary with the similar shaped copper coins of Pantaleon and Agathokles.<sup>3</sup> He has been corroborated by the discovery at Taxilā of a hoard of copper coins which contained 9 pieces of Pantaleon, 15 of Agathokles, 84 single-die pieces, and 27 double-die coins,<sup>4</sup> which prove that these single-die and double-die coins were together in circulation along with the coins of Pantaleon and Agathokles. That these single-die coins are older than the double-die issues is proved by the fact that they conform to the indigenous weight system of India whereas the weights of the double-die coins are influenced by the Greek standard. If Pantaleon and Agathokles were ruling in Gāndhāra

<sup>1</sup> J.B.O.R.S., June, 1936.

<sup>2</sup> A.S.I.A.R., Vol. V—Explorations at Rajgir.

<sup>3</sup> C.A.I., p. 53.

<sup>4</sup> A.S.I.A.R., Vol. XIV.

in cir. 200 B.C., the single-die coins must have been current considerably before that time. It is not improbable, that they were in circulation along with the silver punchmarked coins, a view which is supported by Cunningham, when he says, 'from the scarcity of copper punchmarked coins, I am led to believe that they (the cast) must have been current together with silver coins.<sup>1</sup> The cast coins must have been driven out of circulation when they were replaced by the large number of Kushan copper coins during the 2nd century A.D.

S. SINGH ROY.

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<sup>1</sup> C.A.I., pp. 59-60.





1



2



3



4



5



6



7



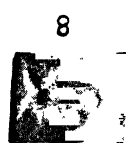
10



11



9



8

THE COINS OF RAJGIR.



### 330. TWO NEW ANDHRA COINS.

The two coins described in this note were obtained from a shroff at Karad in Satara district, and are said to have been recovered from the bed of the Krishna at Karad, where people usually search for coins and ornaments after the annual floods have receded. The provenance of the coins being Karad, they may be taken to have been current in Satara district.

#### (1) Coin of Mūla Sa(dakani).



Obv.



Rev.

Metal, lead; size roughly circular, .8" ; weight 142.7 gr.

*Obv.* Maned lion to the l. ; circular legend with considerable space between the consecutive letters, *Mula Sa (dakni)sa*. It commences near the front feet of the lion.

*Rev.* Above to the r. tree in railing ; to the l. *Chaitya* with two small arches, surmounted by a larger arch, each having a dot within. Below : Wavy line (signifying a river ?) between straight lines.

From the metal and type it is clear that the coin belongs to some ruler (or feudatory) of the Āndhra dynasty. Its precise attribution is however difficult. The legend is fragmentary and the type does not agree entirely with any one known so far.

The obverse type, lion to the right, is so far known to appear on the Āndhradeśa variety of the Sātavāhana coins (see Rapson, *A catalogue of Indian coins, Andhras, etc.*, pp. lxxviii-lxxix) ; these, however, have no *Chaitya* and tree in railing on the reverse. The reverse of the present coin bears some affinity with the lead Āndhra coins found at Kolhapur, on which we have a *Chaitya* and a tree in railing standing side by side, with this difference that the *Chaitya* has only four tiers instead of two, as in the Karad specimen.

Other analogous coins are the issues of Chūtukaḷānanda and Muḷānanda found in North Canara district (Rapson, *Ibid.*, pp. 59-60, Pl. VIII, G.P. 2 to G.P. 4) on which the arched *Chaitya* and the tree in railing are found, but on different sides and not on the same as on the present coin.

The closest resemblance to the present coin is found on the issues of Sadakana Kaḷalāya Mahārathi from Chitaldurg district (*ibid.*, pp. 57-8 and pl. VIII, Nos. 233-4). In both cases the reverse side has a *Chaitya* and tree in railing side by side, the former consisting of two small arches surmounted by a bigger one. But on the coins of Sadakana Kaḷalāya there is a crescent on the *Chaitya* and there is no common platform for the *Chaitya* and the tree. On the obverse of the coins of Kaḷalāya Sadakana there is a bull (instead of a lion) but the style of the circular legend around the animal is identical.

To judge from the spacing of the preserved letters on our coin, its legend could have consisted only of seven or eight letters. The extant letters are *Mula Sa . . . sa*. After the first *sa* there is a remnant of *da*. I would therefore complete the legend by inserting *dakani*, the whole legend thus reading *Mula Sa(dakani)sa*, ' (The coin) of Mula Sadakani '.

It is difficult to identify this Mula Sadakani with any known ruler or feudatory of the Āndhra dynasty. The name of the third ruler of the Āndhra dynasty is spelt as Mallakarṇi in the *Matsya Purāṇa*, while all other Purāṇas spell it as Śātakarṇi. If the medial *u* mark of *Mu* were not clear, it would have been possible to attribute our present coin to the third ruler of the Āndhra dynasty and the palæography of the coin would have been in favour of this view. It is also proved that Mahārāshtra had passed into the hands of the Āndhras earlier than the time of this king, and a coin of his could well be found in Satara district. But the medial *u* mark of *Mu* is quite clear on the coin, and the majority of Purāṇas spell the name of the third king as Śātakarṇi, and not as Mallakarṇi. We cannot therefore support this identification.

The next alternative is to identify Mula Sadakani of this coin with Muḷānanda of the Chuṭu family (Rapson, *ibid.*, p. 60, pl. VIII, 236 and G.P. 4). The names of the rulers of the Chuṭu family, however, ended in Ānanda and it is absolutely clear from the extant portion of the legend on the present coin that king Mula did not add that affix to his name. The second letter on the present coin is spelt as *la* and not as *ḷa* as on the coins of Muḷānanda. The palæography of the present coin indicates that it belongs to an earlier period and the resemblance between their types too is not very close as shown already.

The closest resemblance of the present coin is, as shown above, with the coins of Sadakana Kaḷalāya Mahārathi found in Chitaldurg district. Rapson has suggested with some hesitation that

Kaḷalāya Sadakana of the coins was probably the father of Queen Nayanikā, wife of Sātakarṇi I (*ibid.*, p. lxxxiii). The close resemblance in type suggests that Mula Sadakana of the present coin very probably belonged to the same family. Palæography shows that Mula could not have come much later than Kaḷalāya. Probably he was a son of the former. The coins of Queen Nayanikā's father have so far been found only in Chitaldurg district. That the present coin should have been found in Satara district, about 350 miles north of Chitaldurg, does not go against the proposed identification as coins travel long distances with their owners. We know further from the larger Nānāghāt inscription that when Sātakarṇi I died, his sons were very young, and that the administration was being carried by his widowed queen as the regent. It is quite probable that she may have taken help in the task from her brother, entrusting to his care the western portions of her vast dominions. Mahārāshtra may well have been entrusted to his care, and it is therefore quite natural that his coins should be found in Satara district, so far away from Chitaldurg. I would therefore tentatively suggest that the present coin should be attributed to a member of the Sadakana family; who was very probably a son of Kaḷalāya of Chitaldurg coins.

(2) A coin of Vāsishṭhīputra Viḷivāyakura.



*Obv.* Bow and arrow; circular legend, commencing (XII)  
*Raño Vasi (thīputasa Viḷivā) yakurasa.*

*Rev.* Chaitya of four tiers, with a dot in each arch, surmounted by a crescent and a tree, standing on a railing ornamented with scroll and dots; left, *Nandīpāda*, right, a damaged symbol.

Metal, potin; shape, circular with a diameter of .7", weight, 45 gr.

Though the legend is fragmentary, the attribution of this coin presents no difficulty. It is undoubtedly a coin of King Vāsishṭhīputra Viḷivāyakura, whose coins were discovered in the Kolhāpur hoard. Only six of the potin coins in that hoard were of some use for the purpose of decipherment (*J.B.B.R.A.S.*, XIII, p. 303); the present coin showing half the legend in a legible condition is therefore a rare one. Most of the



bow and arrow type of coins published so far have come from the Kolhāpur hoard. The present coin was discovered in the bed of the Kṛishṇā river in Satara district and would show that if Vāsishṭhiputra Viḷivāyakura was a feudatory, his sway extended over the Satara district as well.

A. S. ALTEKAR.




### 331. NOTE ON AN ALLEGED COIN OF RUDRASENA.

It has been suggested recently by Mr. K. P. Jayaswal that the coin published in the Indian Museum Catalogue of Coins, Plate XX, No. 5, should be attributed to the Vākātaka ruler Rudrasena I (*J.B.O.R.S.*, Vol. XIX, pp. 72-73 and plate III). This view, however, does not seem to be a correct one. It is very doubtful whether on the obverse of this coin we can read above the wheel the letters *Rudra*. Several other coins of this very type have been published and we naturally expect them to show the legend *Rudra* in the place concerned. Cunningham is said to have possessed seven coins of this variety, all of which were picked up in or near Kosam (*I.M.C.*, p. 146). We, however, possess only three more facsimiles of other coins of this variety, published in Rapson, *Indian Coins*, pl. III, No. 12, Cunningham, *Coins of Ancient India*, pl. V, No. 7 and Prinsep, *Essays*, Vol. II, pl. 44, No. 6. A glance at these facsimiles will show that they are all identical coins issued from similar dies. Above the wheel there are no traces of the letters *Rudra* but another symbol which looks like a trident or *triratna*. In the facsimile of the coin in the Indian Museum this symbol is but imperfectly seen, but it is quite clear in the three other facsimiles mentioned above. It thus becomes clear that we cannot read the name Rudra above the wheel as has been suggested.

A. S. ALTEKAR.



I. *The So-called Gold Token of Kumāragupta I.*

In Numismatic Supplement, XLIV, No. 309, Rai Bahadur Prayag Dayal has described five thin gold plaques which he found in the cabinet of the Provincial Museum, Lucknow. The most intriguing of these curious pieces has been identified by him as a gold token of Kumāragupta I. I propose to consider here this identification. A cogent objection to the ascription to Kumāragupta I would be that it seems highly improbable that Kumāragupta I, who issued a very large number of gold coins of a great variety of types and also issued silver coins in considerable quantities, should have issued in addition any tokens. We know that he had occasion to order a special issue to be struck, namely his Aśvamedha issue, which in fabric and weight is like the coins issued by him and his predecessors of the Gupta dynasty. The thin piece of gold which Rai Bahadur Prayag Dayal describes as a token of Kumāragupta I is very unlike the issues of the Gupta Emperors up to and including Kumāragupta I. The fabric and style are entirely dissimilar. Again the attribution of the piece to Kumāragupta I cannot be justified on paleographical grounds. The style of writing and the formation of the letters are unlike those of his numerous known coins. Taking individual letters into consideration the 'ha' in 'Mahendra' on his gold coins is shaped thus:  but on this plaque  which, although a fifth century form, does not occur on any of his coins. On a large number of Kumāragupta's silver coins issued for his western provinces and on his silver-plated coins of Valabhi fabric the letter 'ha' takes the form peculiar to the western Gupta script thus:  while its shape on the plaque is different as we have just seen. Apparently Prayag Dayal has based his identification of the piece solely on the ground of the occurrence on it of the words 'Śrī Mahendrāditya'. This, he says, is a name of Kumāragupta I which 'appears on his silver and silver-plated coins'. To be strictly accurate it is only on the silver coins of his western issues and on his coins of Valabhi fabric that he is styled 'Kumāragupta Mahendrāditya' but never simply 'Mahendrāditya'. The legend 'Mahendrāditya' does not occur on his other silver coins or on any of his gold issues. As regards the letter 'ru', which is found next to a cluster of seven dots, Prayag Dayal states that it has 'not been met with so far', 'ru' does not occur on coins of Kumāragupta I, but is

to be found in the field on the coins of Prakāsāditya and Vishnugupta, two later rulers, and this fact alone would leave no room for doubt that a later date than the reign of Kumāragupta I, must be assigned to the plaque. It does not seem possible to explain with certainty the device on the coin in all its details although Rai Bahadur Prayag Dayal sees in the figure on the plaque 'Garuda in the usual attitude with his wings spread out. To his right are a crescent and an oval object encircled by dots which perhaps stands for the sun'. What look like very small circular dots are not to be found round any motif on any known Gupta coin but are to be found on later coins, e.g., round the elephants in the abhisheka scene on the reverse of Saśāṅka's coins (*vide* B.M.C., Pl. XXIV, 1), and this also points to a later date. So also does the border of large dots, which is quite unlike the border of little dots to be found on Gupta coins, but occurs for the first time on the late imitation Gupta coins found in Bengal, and is a characteristic feature of the coinage of a number of rulers of mediæval India, e.g. Gāṅgeyadeva of Chedi.

If due weight is given to all the above considerations we cannot but come to the conclusion that the identification of the plaque under discussion as a gold token of Kumāragupta I must be rejected and the plaque must be assigned to some later king of the sixth or seventh century A.D. who may have taken the title of 'Mahendrāditya', possibly the Kumāragupta of the Bhitari seal.

As regards the remaining pieces described by Prayag Dayal, they are all very crude and can only be described as clumsy plaques, on which the design is a travesty of motifs occurring on numerous Kushan and Gupta coins. These pieces and the so-called token are not unconnected, as the size is about the same and all have similar borders of dots and the execution is crude, although the so-called token is of better workmanship than the others. Other points of agreement are the light weight and thinness of gold, which has been impressed on dies so that the design stands out in relief on one side only. Their broad style reminds one of the late imitation Gupta coins of Bengal, but, in the absence of any recorded data of their provenance, we cannot assign them to any particular locality. Probably they were intended for use as charms or ornaments, like the gold plaque with a head in profile embossed on it, found at Bhitā by Sir John Marshall (Annual Report of the Archaeological Survey of India, 1911, Pl. XXXII, No. 11).

## II. *A Rare Variety of Samudragupta's Standard Type.*

There is a very rare variety of the Standard type of Samudragupta's coinage to which the attention of numismatists does not appear to have been drawn by the leading authority on the Gupta series, Mr. John Allan, the author of the British Museum catalogue, or by previous writers such as V. A. Smith and Prof. Rapson. This is a coin on which the king is shown wearing a dagger. I have a fine specimen in my collection and have noticed one in the British Museum (B.M.C., Pl. I, 12), but I find that this variety is not represented in the Indian Museum collection. Particulars of the coin illustrated above from my collection are :—



AV. S. 8—*Obv.* Samaraśatavitatavi . . . ripuraji . .

Wt. 121·0. *Rev.* Parākramah.

Symbols on reverse on right and left of throne as on B.M.C., Pl. I, 12, but the die is different.

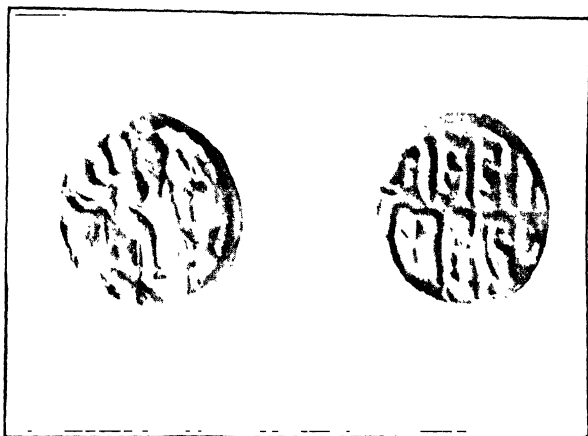
The importance of the coin for numismatists lies in the fact that it establishes a link with varieties of the Battle-axe type in which the king is represented as wearing a dagger (B.M.C., Pl. IV, 8–10, 15). The dagger variety, as we might call this coin, of the Standard type is earlier and the use of the weapon on the Battle-axe type is a development from it ; in the former the dagger is worn in an aslant fashion in front and in the latter like a short sword at the side.

AJIT GHOSE.



### 333. A GOLD COIN OF VIRASIMHA.

This coin is in the collection of Mr. Ajit Ghose, the well-known collector of antiquities and coins of Calcutta. It was obtained from Gwalior, and may, therefore, be considered as originating from its neighbourhood.



Its obverse shows an unusually spirited representation of a horse with a warrior riding it. The horse is in full gallop, the tail is up, the head bent down; on the crest there appears to be two feathers or similar ornamentation, and there are clear traces of a saddle, which is rather rare in representations of this period. The rider in his uplifted right hand seems to be carrying some weapons, while his left holds the reins. On the whole the horseman compares very favourably with the stereotyped linear representations familiar on the coins of the Shahiyas and their imitations which lack the strong relief of the present coin. On the reverse the legend in two lines is written in characters of about the 12th century A.D., line 1, *Śrīmad-Vīra*, and line 2, *Simhadeva*. There are traces of some device, apparently a lotus below the second line. The border of dots can be discerned on the obverse and also possibly on the reverse. The gold appears to be quite yellow and pure, but the size is very small ('45" in diameter) and weight only 13·8 grain.

The only king of the name of Virasimha, of whom we have any record about this period, is the prince who is the donor of the copper-plate published in the *Journal of the American Oriental Society*, Vol. VI, pp. 542ff. It refers to the gift of this



king from his fort of Nalapura (the modern Narwar, a District in Gwalior State) in the year V. S. 1177=1120-21 A.D. The king who calls himself Mahārājādhirāja, belongs to the Kachhha-paghāta Dynasty, his predecessors being named as Gaganasimha and Saradasimha. It is this king to whom the present coin can be attributed with certainty. Gold coins weighing from 66 to 68 grains were issued about this period by the Rāthor king Govinda Chandra whose dominions lay to the north-east, the Chedi Kings to the south-east had their own coinage, while the Tomara King Mahipala who ruled over Delhi and Ajmer to the north and north-west, issued copper coins. Virasimha, however, seems to have designed an original type, in which the horseman was adopted on the obverse and a legend more or less on the lines of the coins of Chandellas and Gaharwars on the reverse.

The present coin is almost similar in weight to the base issues of Jājalladeva which appear to be about one-fifth the weight of the bigger pieces or *drammas*. In Vincent Smith's Indian Museum Catalogue, p. 251, the coins of Gāṅgeyadeva weighing 7 grain, were supposed to have been equivalent to one-eighth *dramma*. I should, however, think that as most of the coins weigh from 60 to 64 grain, and some coins of Govinda Chandra weigh even as much as 68 grain, it is likely that the standard weight was about 70 grain, and the small coins weighing from 13 to 14 grain may be considered as one-fifth and those weighing 7 grain as one-tenth of a *dramma*. It is, however, likely that there was no uniformity in the standard of the issues of the various dynasties of the Central and Northern India at this period.

A class of gold coins with the legend, *Śrīmad-Virasimha-Rāma*, is known. One specimen exists in the Lucknow Museum and another found in the Gorakhpur District was published by Vincent Smith in *J.A.S.B.* Vol. LXVI, Pt. I, 1897, p. 308. The reverse side shows a seated god almost like that on the coins of Gāṅgeyadeva, but the deity is a male figure, holding *chakra* and *gadā* in the hands and thus appears to be a form of Vishnu, instead of the goddess on other coins of this period. Vincent Smith regarded this coin as a puzzle, as he could not find any king with the name of *Virasimha-Rāma* in the lists of the Kalachuri, Chandela, Rathor, Tomar or Chauhan dynasties. It does not seem probable that Virasimhadeva and Virasimha-Rāma were names of one and the same individual, as the locality where the present coin was acquired is situated far away from the eastern United Provinces where the other two coins were collected, and the types are quite different. But the kings appear to belong to the same period, viz. the 11th-12th century A.D.

The coinage of Narwar was continued in the 13th century by two rulers named Malayavarman and Chāhaḍadeva, both of whom issued copper coins with the horseman type on the

obverse. It is, however, remarkable that neither of these rulers belonged to the Kachchhapaghāta Dynasty of Virasimha, the former being a Pratihāra and the latter a Jājapella. It will thus be seen that the present coin is a unique example of the numismatic issue of a dynasty known only from their epigraphical record in Gwalior territory.

K. N. DIKSHIT.



### 336. A NOTE ON THE BILINGUAL COINS OF SULTAN MAHMUD OF GHAZNI.

The bilingual issues of Sultan Mahmud are well-known from the Catalogue of Coins in the British Museum (Lane poole Nos. 505-514), published in Plate VI. The remarkable point about these coins is the attempt made by Sultan Mahmud for the first and last time in the annals of Muslim Numismatics to translate the whole of the Arabic legend into Sanskrit. The translation of *Allā* by *Avyakta*, and *Rasūl* by *Avatāra*, is in particular an interesting attempt. I would, however, confine here my remarks to the marginal legend which appears on the two types of coins. The word *Bismillā zarb* has been translated almost literally as *Avyaktiya-nāme hatō* (struck in the name of God). The last word is quite clear on a coin which was recently obtained for the Indian Museum. It has been read before as *tata* or *tate*. There is no necessity to read *nāme* for *nāme*, the regular form. The expression *ayam tamkaṁ* is of course not in order, and should have been *ayam tamkaḥ*. The next word may be read as *Mahamūdapure* instead of *Mahāmūdapura*. In coins Nos. 510-514 constituting the second class struck in 419 A.H., the marginal legend is slightly different, the word *avyaktiya-nāme* being dropped and some word added before *Samvati*. The legend here seems to be *ayam tamkaṁ Mahāmūdapuraghate hata(o)*. *Ghata* here apparently stands for *ghaṭṭa*=a custom station, then a mint. The word following *hata* has been read as *jikīyera*, but has not yet been satisfactorily explained. I, however, draw the attention of numismatists to the fact, that the word must be some equivalent of the 'Hijri' Era, to which the dates on these coins are to be referred. I tentatively read the word as *Jināyana*, which means the 'passing or transit of the prophet' referring to the Prophet's transit from Mecca to Medina. Here again it is noteworthy that the prophet is referred to as the Jina, a term used by the Buddhists and Jains to denote the founders or supreme teachers of their religion, and it is thus a singularly appropriate expression for a prophet. The word *ayana* means 'transition', as in 'dakṣiṇāyana' = the transition (of the sun) to the south, i.e. the summer solstice, and it is aptly applied to the prophet's transit to Medina which was such an important turning point in the history of the Islamic faith that a new era was calculated from this date.

K. N. DIKSHIT.



### 335. THE TRIBAL COINS OF NORTHERN INDIA.

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#### INTRODUCTION.

Monarchy was the form of government that prevailed in the Vedic period. It was in post-Vedic times, that experiments in constitution making began, and republics and aristocracies came into existence. Mr. K. P. Jayaswal in his monumental work on Hindu Polity has given us all the available data about them. The Republics were generally designated *Gaṇas*, as these states or *Samghas* were governed by assemblies, 'so-called because of the 'number' or 'numbering' of the members present'.<sup>1</sup> Pāṇini (c. 500 B.C.) refers to a number of republics which are designated *Āyudhajivin Samghas* i.e. the Samghas which 'observed the practice of arms or military art'. These are : (1) the Vṛika, (2) the Dāmani (and others), (3) the Trigartta-Shashtha or the League of the six Trigarttas, (4) the Yaudheyas "and others" and the Parśva and others. The six Trigarttas were the (a) the Kaṇḍoparatha, (b) the Dāṇḍaki, (c) the Kaushṭaki, (d) the Jālamāni, (e) the Brāhmagupta, and (f) the Jānaki<sup>2</sup>. These republics according to Pāṇini were situated in the Vāhika country which is interpreted by Jayaswal to mean the country of the rivers and comprised the Sindh valley and the Punjab. Pāṇini also names six other communities which are known to be republics—(1) the Madra, (2) the Vṛiji, (3) the Rājanya, (4) the Andhaka-Vṛishṇi (5) the Mahārāja, and (6) the Bharga. Buddhist Literature also records the names of a

<sup>1</sup> Jayaswal—Hindu Polity, p. 27.

<sup>2</sup> *Ibid.*, p. 35.

number of republics—(a) the Sākya of Kapilāvastu, (b) the Koliyas of Rāmagrāma, (c) the Licchavis of Vaiśālī, (d) the Videhas of Mithilā, (e) the Mallas of Kusinagar and Pāvā, (f) the Moriyas of Pippalivana, (g) the Bulis of Allakappa and (h) the Bhaggas or the Bhargas. The Licchavis and the Videhas were jointly called the Vrijis or Vajjis. These states extended 'from the districts of Gorakhpur and Ballia to the district of Bhagalpur, to the north of Magadha and the south of the Himalayas'.<sup>1</sup>

Another group of republics is referred to by Kautilya. Of the *Rājasaṃdopaṇḍit* in Saṃghas i.e. the republics in which the leaders had the title of kings, Kautilya 'enumerates: (1) the Licchhivikas, (2) the Vrijikas, (3) the Mallakas, (4) the Madrakas, (5) the Kukuras, (6) the Kurus, (7) the Pāṇchālas and others'.<sup>2</sup> The other class of republics, the *Sastropajiv* in Saṃghas were: (1) the Kāmbojas, (2) the Surāshtras, (3) the Kshatriyas, (4) the Śrenis and others'.<sup>3</sup> The Vrijis here perhaps refer to the Videhas only. Some of these states changed from monarchy to republic e.g. the Kurus, the Videhas and the Pāṇchālas. The Licchhavis are famous in Buddhist Literature and had a long history, but the Mallas perhaps did not survive the Mauryas; so also was the case with the Kurus. The Pāṇchālas however came down to the time of Patañjali, i.e. after the Mauryas. The Kukuras were members of the Andhaka-Vṛiṣṇi League. The Kāmbojas lived in eastern Afghanistan, the Surāshtras in Kathiawar and the Kshatriyas and Śrenis in Sindh. Jayaswal's identification of the Kshatriyas, the Xathroi of the Macedonian writers as a political body and not a caste denomination is fully justified. The *Argesinae* with its variants *Agesinae*, *Acensoni* etc. can surely be identified with the *Agra-Śrenis* or the First Śrenī, i.e. one of the branches of the republican people the Śrenis which had perhaps a number of divisions, like the 3 sections of the Yaudhayas, of which the 2nd and the 3rd sections are referred to specifically, on their coins.

The Macedonian writers give a long list of aristocratic and republican states with which the Greeks under Alexander came into contact. The *Kathaians* (the *Kathas*) lived to the east of the Ravi or the Hydraotes including the districts of Lahore and Amritsar, and their capital was Sankala. Alexander met with a number of republics before he reached the Kathaians. At a little distance from the Ravi dwelt the *Adrestai* who had been identified by Jayaswal with the *Arishtas* of Pāṇini. The *Sabhtu* state, was situated near the Kathaian territory and extended to the Salt Range. On the east of the Hyphasis or Beas dwelt a people with an aristocratic form of government and Jayaswal suggests from the discovery of the *Yaudheya* coins in the locality

<sup>1</sup> *Ibid.*, p. 48.<sup>3</sup> *Ibid.*, p. 60.<sup>2</sup> *Ibid.*, p. 57.

that they were really the Yaudheyas of old who were good agriculturists, brave in war and had an excellent system of government.

Alexander during his retreat met with a number of republics which covered the region down the Indus to the Baluchistan frontier. The most powerful states were the *Oxydrakai*, the *Malloi* and the *Siboi*,—the Kshudrakas, the Mālavas and the Sivis or Saibyas. The Mālavas dwelt on the Jhelum below its confluence with the Chenab, while the Kshudrakas had their territories higher up. The Sivis also dwelt near the Mālavas. Nearby lived the Agsinæ who have been identified with the Agra-Śrenis by Jayaswal and the next republican people were the *Ambashthas* who are referred to by the Greeks as *Sambastai* or the *Abastanoi*. The *Xathroi*, the *Ossadioi* and the *Musicanī* have been restored to their Sanskrit forms by Jayaswal as the Kshtriyas, the Vasātis and the Muchukarna. The *Brachmanoi*, were the Brāhmanas who had a little republic to the north of *Patala* which was situated in the Indus delta, identified with Hyderabad in Sindh. The *Phegelas* and the *Glaukanikoi* have been identified with the Bhagala of the Gaṇapāṭha and Glauchukāyanakas of the Kāśikā. It is thus evident that in the 4th century B.C. the Punjab and Sindh region was covered by a large number of republican and aristocratic states and we have no reason to take the list of the Greek writers as exhaustive. Alexander did not traverse the whole Punjab, so it is reasonable to expect that there were other republics in the Vāhika country and Jayaswal mentions the names of the *Yaudheyas*, the *Āraṭtus*, the *Sayanḍas*, the *Gopīlavas*, and the *Kaundibryas*.

The establishment of the Maurya Empire sounded the death-knell of the smaller republican or aristocratic states. Only the bigger states like the *Kshudrakas*, the *Mālavas*, the *Rāshtrikas*, the *Bhojakas* and the *Vrijis* survived the imperial domination. A few are also mentioned by Asoka in his Rock Edicts. There is no doubt that the *Rāshtrika-Bhojas* and the *Pitinikas* had republican constitutions. The *Gāndhāras*, the *Nābhakas* and the *Nābha-pāṅktis*, and the *Yavanas* had perhaps a similar system of government. But as regards the *Andhras* and the *Pulindas*, we have no definite data, though Jayaswal would like to infer that as *Rājaviśhayas* i.e. 'ruling (or sovereign) countries (or districts)', they were of the same category i.e. republican.

Only the stronger republics outlived the imperial domination of the Mauryas. But a few new states came into existence under the Śungas. In Mr. Jayaswal's opinion, the establishment of the Northern Satraps at Mathura compelled the stronger republics to migrate to Rajputana. The Yaudheyas, the Madras, the Mālavas and the Sibis left their original homes in the Punjab and migrated to the desert region of Rajputana for comparative safety. It was their love of independence that constrained them



to exchange their fertile lands for their new homes. The *Ārjunāyanas* perhaps came into existence during the Śunga times and they also migrated to Rajputana. The *Vāmathas* and the *Sālankāyanas* are also supposed to have been 'founded in the closing and weak period of the Mauryas'. The *Kukurās* and the *Śūdras* remained in their original homes in the Punjab and the *Vṛishṇis* are found in Mathurā where they lived as of old. Jayaswal has succeeded in rescuing the names of a number of such states, but it is evident that the republican and aristocratic states were very large in number and scattered over the whole country, and they passed through various changes in constitution. The non-monarchical states disappear in the 5th century A.D. and for this, perhaps, the Imperial Guptas were mainly responsible.

It is absolutely certain that these non-monarchical states or at least many of them issued coins when the new invention came into existence in this country, perhaps early in the 8th century B.C.<sup>1</sup> But the earlier coins were of the punch-marked variety. So it is not possible to ascribe these coins, with symbols impressed on them, to the different republican or aristocratic states. If we could identify these symbols which served as emblems or insignias of the different states, a correct identification of the coins would be possible. But the data available are not sufficient to identify the old punch-marked coins issued by the tribal states. Even when the system of die-struck coins with legends on them, came into use, some of the tribes refrained from adopting the innovation. The Madras were the contemporaries of Samudragupta but they left no inscribed coins. We cannot therefore, expect to identify all the tribal coins even of the latest period.

The Tribes and Peoples with non-monarchical constitutions which issued inscribed coins and about whose identity there is absolutely no doubt are the following—the *Ārjunāyanas*, *Aśvakas*, *Audumbaras*, *Kulūtas*, *Kuṇindas*, *Mahārāja Janapada*, *Mālavas*, *Nāgas*, *Sibis*, *Rājanya Janapada*, *Vimakas*, *Vṛishṇis*, *Uddehikas*, and the *Yaudheyas*. In the case of the *Vimakas*, their coins only, testify as to their existence; we have no reference to them elsewhere, and this is the only source of information about them. A discussion about the tribal coins of die-struck variety might enable us to identify their punch-marked coins also, as a result of the recognition of their special symbols.

The forms of the coin-legends incidentally point to their political organisation. Some of the republics issued coins in the name of the *Gaṇa* e.g. the *Yaudheyas*, the *Mālavas*, the *Ārjunāyanas* and others. Some of the *Yaudheya* coins were

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<sup>1</sup> S. K. Chakraborty—A Study of Ancient Indian Numismatics, Chapter II.

issued in the name of the *Gaṇa* and their *Mantra-dharas*<sup>1</sup> or the Executive Council. The *Vṛishṇi* coins were perhaps issued in the name of the *Rājanya* and the *Gaṇa*. Jayaswal has determined the 'constitutional significance of the word *Rājanya*' and takes it to mean 'the leaders of the families consecrated to rulership' among the *Vṛishṇis* who had perhaps an aristocratic constitution. There is nothing improbable in the issue of coins by the republican states in the names of their executive heads e.g. *Rājanya-Mahamitasa*, (of the *Rājanya* or President *Mahāmītra*)<sup>2</sup> and such others.

### THE WEIGHT-SYSTEMS.

The punch-marked coins of copper and silver are the oldest coins of this country. These are based upon two weight systems—one for silver, the *Purāṇas* or *Dharaṇas*, and the other for copper, the *Kārshāpaṇa*,<sup>3</sup> both however dependent upon the *rati* or *raktika* 'the red-and-black berry of the *Guñja* plant' also known as *Krishṇala* or the 'black'.<sup>4</sup> The silver *Purāṇa* weighs 32 *ratis* while the copper *Kārshāpaṇa* was of 80 *ratis* and these coins had their sub-multiples—the *ardha*, *pāda* and so on. The *Purāṇa* is equated to 56 and a *Kārshāpaṇa* to 140 grains by Prof. Bhandarkar.<sup>5</sup> The extant coins however fall far short of the standard weight and this will be evident from a comparison of the weights of the coins catalogued by V. Smith.<sup>6</sup> In the case of the copper coins the variation from the standard weight seems to be greater than in the case of the silver ones. In determining the amount of variation from the standard weight, we have to grapple with some uncertain factors. First of all the weight of the *rati* is not fixed. It is the seed of a tree and the ripe fruits are sure to vary in size and weight. As a matter of fact some of the scholars who took the trouble of weighing a large number of ripe *Guñja* seeds arrived at different averages. Cunningham takes a *rati* as equal to 1.83 gr., Elliot as 1.68 gr., Smith as 1.825 while Bhandarkar equates a *rati* to 1.75 gr.<sup>7</sup>; it is likely that the *rati* weight was not the same throughout the country. Moreover we have to take into account the wear and tear to which the coins were subjected throughout the centuries that they were in circulation, the corroding influence

<sup>1</sup> J.H.P.I., pp. 40, 83, 151, 181.

<sup>2</sup> *Ibid.*, p. 160.

Cunningham, Sir A.—Coins of Ancient India, p. 69 (pl. IV, figs. 8 and 9).

<sup>3</sup> Chakraborty, S. K.—A Study of Ancient Indian Numismatics, Chapter III—'Weights and Coin Denominations'.

<sup>4</sup> Cunningham, Sir A.—Coins of Ancient India, p. 45.

<sup>5</sup> Bhandarkar, D. R.—Ancient Indian Numismatics, p. 212.

<sup>6</sup> Smith, V. A.—Catalogue of Coins in Indian Museum, pp. 136–142.

<sup>7</sup> Chakraborty, S. K.—A Study of Ancient Indian Numismatics, p. 51.

of earth and climate and the inveterate habit of clipping, a vice which was very prevalent before the introduction of milled edge to the coins in recent times. It is difficult however to determine upon the percentage of variation that must be allowed for the different factors but the cumulative result is a marked difference from the standard weight which seems to be greater in the case of copper. Cunningham took 800 punch-marked silver coins from all parts of India and found the average weight as 'upwards of 47 grains', that is, a loss of 9 grains taking 56 grains as the standard weight of a Purāṇa (or 19 p.c.). He also hazards that 'the average loss of these punch-marked coins was not more than one grain and a half in a century',<sup>1</sup> if these coins are taken to be in circulation for 600 years from 450 B.C. to 150 A.D. But his conclusion is vitiated, as it is impossible to take for all these coins a life of 600 years; some of them might be recent issues, minted just before the punch-marked coinage went out of use. So Cunningham's estimate of loss seems to be the lowest for the silver coins; actually the loss must have been much greater; while in the case of the copper coins, taking into account the nature of the metal itself, the loss must have been heavier. The conclusion therefore that we cannot expect the extant coins to be exactly of the standard weight, whether of indigenous or foreign origin is well-attested and admits of no doubt; but the greater the variation from the standard weight, the less reliable are our conclusions about the identification of the weight standard.

A new standard weight was introduced by the Persians with their occupation of the Punjab by Darius I Hystaspes. His gold coins the *Darics* weighed about 130 grs. and the silver coins of the Persian Empire, the *sigloi* were equated to 86.45 grs.<sup>2</sup> Very few gold *Darics* came to this country but the silver *sigloi* came to this country in the course of commerce in comparatively large numbers. India though a producer of the precious metal had no gold coinage before the Kushanas and the difference in the price ratio between gold and silver in India as compared with the West, facilitated the export of gold from India and made it highly profitable to bring in silver either in specie or in coins from outside.<sup>3</sup> The Athenian 'owls', the Seleucidan coins and their Indian imitations were based upon the Attic drachm of 67.5 grains.<sup>4</sup> The multiples of the drachm were the tetradrachm, didrachm and the sub-multiples were the tetrobol, diobol, trihemibol and the obol. The Graeco-Bactrian kings also adopted the Attic standard and their coinage was based upon the Attic drachm of 67.5 grs. But the later Indo-Greek king gradually swung on to the Persian standard and gave up the

<sup>1</sup> Cunningham, Sir A.—Coins of Ancient India, p. 55.

<sup>2</sup> *Cambridge History of India*, Vol. I, pp. 342–44.

<sup>3</sup> *Ibid.*, p. 343.

<sup>4</sup> *Ibid.*, p. 387.

Attic weight standard.<sup>1</sup> Heliocles was the first to adopt the new standard; and he as also his successors, Apollodotus and Antialcidas used both the Attic and Indo-Persian standards. The later Greek princes used only the Indo-Persian Standard, a step which cannot be satisfactorily explained. The argument is put forward by Gardner that the change was due to the change in the relative value of the two metals, gold and silver, but this is not a cogent reason. Von Sallet regards it 'as reduced from the Attic standard'.<sup>2</sup> The acceptance of the new standard was perhaps facilitated by the fact that the region where the Indo-Greek kings ruled had been habituated to the Persian standard when it was under Persian domination. The weight of the extant drachms of the Indo-Persic standard naturally varies but there is no doubt that it was substantially the half of a siglos of 86.45 grains, or perhaps a little less. None of the hemi-drachms of the Indo-Greek kings in the Indian Museum exceed 40 grains in weight. One coin of Antimachos II Nikephoros weighs 39.8 grs.<sup>3</sup>; another coin of the same king in fine condition weighs 37.1 grs.<sup>4</sup> Of Nahapāna's coins in the British Museum of the same standard weight, the heaviest weighs 39.3 and the lightest 25.5 grs.<sup>5</sup> So it is practically certain that the Indo-Persian standard was a little less than the pure Persian standard, and 40 grains may be approximately taken to be the maximum weight of these hemi-drachms of the Indo-Greek rulers and those Indian states or tribes or foreign rulers who followed in their wake. However the influence of the Indo-Greek kings was so great that their hemi-drachm of Indo-Persic standard was not only adopted by the people in the western half of Hindustan but also by the Western Satraps of Saurāshtra and Mālwa, and Rañjubula, the satrap of Mathurā.

Of the tribal states the Audumbaras, Kunindas, Vimakas, Vrishnis and the Yaudheyas used silver coins. The Audumbara coin of Dharaghosha (C.C.A.I., p. 67) weighs 37.5 grains. The eight Kuninda coins in Smith's catalogue vary in weight from 30.8 to 34.2, the Vrishni coin has a weight of 32 grains, while the weight of the Yaudheya coins in Cunningham's collection is only 26 grains, much below the average. However there is no doubt that these tribal silver coins are based upon the Indo-Persian standard weight and not on the indigenous weight system of the Purāṇas or Dharāṇas. As regards the copper coins, the identification of the weight standard is exceedingly difficult and in some cases practically impossible. The copper coins may be divided into two sections, those of the monometallic tribes and those of

<sup>1</sup> Rapson, E. J.—Indian Coins, p. 6.

<sup>2</sup> *Ibid.*, p. 3.

<sup>3</sup> Smith—Catalogue of Coins in I.M., p. 29 (No. 12).

<sup>4</sup> *Ibid.*, p. 29 (No. 1).

<sup>5</sup> Rapson, E. J.—Catalogue of Coins of the Andhra Dynasty, etc., pp. 65–70.

people who adopted bimetallism, the two classes being influenced by different monetary principles. Monometallic issues stand apart by themselves, but in the case of bimetallism variations in the relative value of the two metals introduce certain complications in working the monetary system. In India, the monometallism of copper can be regarded as more natural than that of silver, not only because the white metal was rarer and imported from abroad,<sup>1</sup> but because copper seems to have been coined earlier in India. Even copper appears to have fetched a good value in the beginning, but the advent of silver in larger quantities, particularly after the introduction of foreign coinage under the Persian, Indo-Greek and Parthian influence, threw copper to a subordinate position.<sup>2</sup>

The Ārjunāyanas, Āśvakas, Kulūtas, Mahārāja Janapada, Rājanya Janapada, Sibis, Uddehikas, Nāgas and Mālavas issued copper coins only. If any one of them had silver issues, these have not yet been discovered. It is evident that some of these tribes followed the traditional weight standard of the Kārshāpana of 80 ratis for copper coins and the variation in weight of the extant coins may be explained as due to the variation in the weight of the rati in the different parts of the country. The Āśvaka coin in Smith's catalogue (No. 13, p. 157) weighs 146.4 grs., and the other one reproduced by Cunningham weighs 145 grs. So it is clear that they are Kārshāpanas of 80 ratis. The actual weight might have been a little more and proves the rati to be a little heavy. The two Ārjunāyana coins in Smith's catalogue weigh 61.3 and 14.8—the heavier is evidently a Half-Kārshāpana and the lighter is one-eighth Kārshāpana or Dvi-Māsaka. But there can be no doubt that the Sibis had a different weight standard. And of the ten specimens, one has a weight of 18 grains and the others weigh from 63 to 84 grs. The 4 Rājanya coins of pure copper in Smith's catalogue weigh 57.8, 50.4, 79 and 76 grs.; and the weights of the 4 other brass or pale bronze coins of this tribe are 22, 45.3, 34.5 and 68.2 grs.; consequently these coins cannot be ascribed to the system based upon the indigenous weight standard e.g. Kārshāpana of 80 ratis. How much alloy was introduced in the brass pieces and what was the relative value of the metals, we are not in a position to determine without the chemical examination of the contents. We have therefore, no data to come to any positive and final conclusion about the identity of the weight standard adopted by the Sibis, the Rājanyas and also of the Mālavas and Nāgas. But a comparison of the weights of the Mālava and Nāga coins raises a strong presumption that there is some affinity, if not identity, in the weight-systems adopted by these two peoples. Most of

<sup>1</sup> Cunningham, Sir A.—Coins of Ancient India, p. 5.

<sup>2</sup> Chakraborty, S. K.—A Study of Ancient Indian Numismatics, pp. 76-78.

the coins of the Nāgas are very small and the weight varies from 6.3 to 26.2 grs. One coin (No. 15—Smith's catalogue) is unusually thick and weighs 42 grs. If we take the heaviest Nāga coin of 42 grs. to be of standard weight, then it is possible to arrange the other specimens as its sub-multiples—three-fourth, half, and one-fourth : in every case the diminution due to wear and tear etc. being left out of consideration. The weight of 42 grs. is almost that of the silver hemi-drachms. Consequently it appears likely that these copper coins were made equal in weight to that of the silver coins on purpose and an attempt was made to facilitate the interchange of the copper coins with the silver ones from outside—so many copper coins for one silver coin fixed according to the market ratio of the two metals. The Mālava coins are smaller still ; the weight ranges from 1.7 to 40.3 grs. The coin No. 106 in Smith's catalogue is the smallest in the collection and Mālava coins are among the most 'curious and enigmatical'. It is impossible to arrange these coins according to any weight-system and it is almost sure that the same weight-system was not adhered to throughout the period these coins were in circulation. The standard must have varied for the different periods and it might have been due to the change in the relative value of copper and silver. However we have no sufficient data to come to any definite conclusion ; though we should always keep in mind the statement that 'the various systems of weight used in India combine uniformity of scale with immense variations in the weight of units'.<sup>1</sup>

The Audumbaras, the Kuṇḍas and the Yaudheyas had the bimetallic system of silver and copper. The Vimakas and Vṛishṇis perhaps had the same system but up to this time only silver coins of these two tribes have been discovered. The copper coins in the case of the bimetallic tribes may be taken to be token coins. But in ancient times the intrinsic and the face value of the coins must have been almost identical ; otherwise a great scope would be given to the forgers to enrich themselves. When we consider the ease with which the ancient coins could be manipulated, it would have been not only foolish but highly detrimental to trade and commerce to allow any loophole to dishonest persons to secure undue gains. Consequently the weight of the token coins must vary with the variation in the relative price of the two metals, silver and copper.

In the first quarter of the 2nd century A.D. the ratio between gold and silver was 1:10<sup>2</sup> and there are reasons to believe that the ratio between silver and copper was 1: 5.7<sup>3</sup> ;

<sup>1</sup> Rapson, E. J.—Catalogue of Coins of the Andhra Dynasty, etc., p. CLXXXI—quoted from the Imperial Gazetteer of India.

<sup>2</sup> *Ibid.*, p. CLXXXV.

<sup>3</sup> Chakraborty, S. K.—A Study of Ancient Indian Numismatics, p. 87.

the average weight of the 8 silver coins of the Kuṇindas in Smith's catalogue is 32·6, while No. 12, a brass coin weighs 177 grs. and a copper coin No. 13 weighs 144 grs. We know that the copper coins suffer more from wear and tear; and we may take the copper coin approximately 5 times in weight and consequently equal in value to the contemporaneous silver hemi-drachms. So the inference that the copper coins were equal in value to the standard silver coin may be accepted and the other copper coins of lesser weight must be considered to be its sub-multiples. We know that the price of copper relative to silver cannot remain constant, it must vary with the variation in the ratio. As time went on copper must be cheaper, and more and more copper would be needed to equate a copper coin to the standard silver coin, of constant weight. So we can expect the later copper coins to be heavier in weight.

The Chatreśvara type copper coins of the Kuṇindas (Smith—p. 170) are surely much later than the Amoghabhūti type coins which were in circulation from 150 B.C. to 100 A.D. The coin No. 36 (Smith's catalogue) weighs 221·6 and another in Cunningham's collection (Pl. V, fig. 5, p. 72) is 291 grs. in weight. If we take 291 grs. to be the unit, then the other is a  $\frac{2}{3}$ th piece. It appears that by this time the Kuṇindas gave up the bimetallic system and struck to one metal viz. copper; the consequent difficulty was obviated by increasing the weight of the coins, which was more than double the original standard (Smith No. 13, and Cunningham, Pl. V, fig. 5).

The earliest class of Yaudheya coins—the Bull : Elephant Type—dates from the 'beginning of the Christian Era', when the Yaudheyas were habituated to the monometallism of copper. The heaviest of the 7 coins in Smith's catalogue (No. 4) weighs 71·1 grs. and in Cunningham's collection the heaviest was also 70 grs. So these two coins must be identified as Half-Kārshāpanas of 40 ratis each and the other coins may be deemed to be based upon the same standard. Bimetalism was introduced with the Brahmanyadeva type coins of the 2nd century A.D. These are later than the Amoghabhūti type coins of the Kuṇindas. The silver hemi-drachm (Cunningham, Pl. VI, fig. 9) of the Yaudheyas weighs only 26 grs. and was lighter than the lightest Kuṇinda coin in Smith's catalogue (i.e. 30·8 grs.). The Yaudheya copper coins are however comparatively heavy; the heaviest No. 15 (Smith's cat.) weighs 178·5 grs. If this copper coin be equated to the silver hemi-drachm of 26 grs. : the ratio between silver and copper is found to be 1 : 6·8 which in the circumstances is the most reasonable conclusion. This increase in weight is continued in the copper Yaudheya coins of the Warrior type of the 3rd and 4th centuries A.D. But as no silver coin of this type has yet been discovered, the conclusion is irresistible that like the Kuṇindas, the Yaudheyas also, after the 2nd century A.D. fell off from silver. It thus appears that the

Kunindas and the Yaudheyas who were already habituated to the bimetallism of silver and copper reverted to the older practice of issuing only in copper. This might be due to the paucity of silver and consequent increase in its price. But a consideration of the monetary condition of the time suggests another explanation which is plausible. The Kushan Emperors introduced the gold coinage in India and this was later adopted by the Imperial Guptas. So it is evident that from the second century India was being gradually acclimatised to the new system and the bimetallism of gold and copper was prevalent in the imperial territories. The poor tribal states were not rich enough to take up gold coinage in imitation of the Imperial coinage and the continuance of silver was a great hindrance and added an element of complexity to the merchants and others who had monetary transactions outside the individual tribal areas. So the simplest and the most convenient thing for them was to drop silver and to stick to copper which could be readily exchanged with the copper issues of the Kushans or linked up with the gold coinage of the Imperial power.

#### THE METALS.

Various metals and their alloys were used for the purpose of coinage. In ancient India, the earliest coins were of copper<sup>1</sup> but later on silver was also requisitioned for the purpose. Copper is found in ores throughout the country, though it is no longer extensively produced in India. But silver generally came from abroad and the production of this metal was very small indeed. Small quantities have been found though 'associated with lead, in Kūlū and Mānbhum, and at Deogurh in Santal Parganā'.<sup>2</sup> There is however no doubt that India had to depend mainly on foreign lands for her supply of silver. This is referred to in the *Periplus*<sup>3</sup>; and the relative price of silver was always high as compared with the West. The mint ratio between gold and silver in the Persian Empire was 1 : 13·3, while in India the ratio was 1 : 8.<sup>4</sup> This naturally encouraged the importation of silver.

The tribal states naturally based their coinage on copper. Some of them—the Ārjunāyanas, Aśvakas, Kulūtas, Sībīs, Uddehikas, Rājanyas, Nāgas, Mālavas and the Mahārāja Janapada confined themselves to copper only, and did not proceed to bimetallism, while the Audumbaras, the Kunindas and

<sup>1</sup> 'The most ancient Indian coins, I believe, are copper'—Smith's Catalogue, p. 133.

<sup>2</sup> Elliot, Sir Walter—Coins of Southern India, p. 51 (footnote No. 1).

<sup>3</sup> Schoff, W. H.—The Periplus of the Erythraean Sea, pp. 38, 42, 44 and 287.

<sup>4</sup> *Cambridge History of India*, Vol. I. p. 343.



the Yaudheyas used both the metals side by side. The coins of the Vṛishṇis and the Vimakas are only in silver; but the coins of these tribes are very rare and it may be that their coins in copper have not yet been discovered or identified. It is not possible that the Vṛishṇis and the Vimakas had only silver coins while all the neighbouring tribes and states had copper coins, alone or linked with silver. A monometallism of silver therefore seems to be economically unsound, and I have a strong suspicion that the Vṛishṇis and Vimakas had also a bimetallism of silver and copper, though our doubts can only be set at rest by new discoveries. It is however, well-known that in ancient India silver and copper coinages were often independent of each other and circulated in different districts. A copper currency was not necessarily regarded as merely auxiliary to silver currency; but a copper standard prevailed in some districts as a silver standard prevailed in others.<sup>1</sup>

A certain amount of alloy is needed in the manufacture of coins. Kautilya lays down that silver coins should be manufactured with  $\frac{5}{11}$ ths, i.e. 31.25 p.c. of alloy, and the copper coins with  $\frac{1}{4}$  (pādaśivam) i.e. 25 p.c. of alloy.<sup>2</sup> Cunningham however found by examining 113 silver Kārshāpanas<sup>3</sup> that the alloy varied from 13.8 to 24.8. The amount of alloy perhaps depended upon the comparative prosperity of the state or tribe. The earliest Indian coins of silver, the Purāṇas or Dharanas contained about 20 p.c. of alloy.<sup>4</sup> The easiest means of debasing the coinage is to increase the amount of alloy and this is generally due to the economic exigencies of the time (as in the reign of Skandagupta), or from the selfish greed of the ruling prince. But a consideration of the evil effects of debasement of coinage on trade would act as a check on the evil propensities of a prince.

The three coins from Almora have been ascribed by Prof. Rapson to a branch of the Kuṇindas. They appear to be of some alloy of silver and are heavier than any other Indian coins.<sup>5</sup> The increase in weight was perhaps necessitated by the large amount of alloy in these coins and it may be that the issuing authority did not take the trouble of purifying the metal or was unable to do so. Our ignorance of the amount of alloy and the ingredients used for the purpose makes it impossible for us to start a comparison between the coins of the different tribes and the coins of the same tribe in the different periods of its monetary history with a view to come to any conclusion about their economic condition. The different articles which were used as alloys for silver coins were according to

<sup>1</sup> Rapson—Cat. of Indian Coins—Andhras, etc., p. CLXXIX.

<sup>2</sup> Kautilya's Arthaśāstra (trans. by Shāmaśāstry), pp. 98, 105 and 110.

<sup>3</sup> Bhandarkar—Ancient Indian Numismatics, p. 157.

<sup>4</sup> Smith's Catalogue, p. 133.

<sup>5</sup> Rapson—Indian Coins, p. 10.

Kauṭilya,<sup>1</sup> tāmra (copper), tikshṇa (iron), trapu (tin), sīsa (lead) and añjana (antimony). The commentator of Kauṭilya's Arthaśāstra lays down that the alloy for copper should be 'made up of 4 parts of silver, eleven parts of copper and one part of tikshṇa or any other metal'.<sup>2</sup> But it is doubtful whether silver was used for the purpose. It will only increase the value of the copper coin and the purpose might be as well served by other cheaper ingredients like tin etc. Brass is an alloy of copper and zinc usually in the proportion of 2 : 1 or 4 : 3, and a cheap alloy of copper and tin is Kaṁsā or bell-metal, much used in this country. A few specimens included in Smith's catalogue—viz. one Audumbara coin (No. 1), six Kuṇinda coins are of brass and four other Rājanya coins are either brass or pale bronze. We are not in a position to determine the relative purity of the coins of copper or silver and their alloys : and a chemical analysis of the contents of the Ancient Indian Coins is of urgent necessity for the Numismatists.

#### SHAPE, SIZE AND THE SYSTEM OF MANUFACTURE.

The punch-marked coins are of various shapes and sizes. There is uniformity in one point only viz. an attempt was made to approximate them to the standard weight. In shape, they were very irregular—polygonal, rectangular, square, circular and even triangular ; and generally no attempts were made to have the sides straight or regular. This was due to the system of manufacture. A hammered sheet was sub-divided into strips and adjusted to the proper weight, sometimes by clipping the sides.<sup>3</sup> As pointed out by Smith, the cutting of circular blanks from a metal sheet was more troublesome than cutting off short pieces of rectangular shape, and they are evidently simplest in form. It is therefore clear that practically no attention was paid to the shape of the coins and their size would vary according to the thickness of the metal sheet. Some of the copper pieces however might have been manufactured from cast blanks. Symbols were then punched into the blanks and the devices were 'incised and not in relief' and as a result 'stood wear well' and the coins remained long in circulation.

In the West, the Lydians were the first inventors of coinage.<sup>4</sup> They began with globules or buttons of fused metal which were impressed with 'the rude unengraved punches, between which the ingot was placed to receive the blow of the hammer'. The

<sup>1</sup> Kauṭilya—Arthaśāstra (trans. by Shāmaśāstry), pp. 98, 105, 107 and 110.

<sup>2</sup> Kauṭilya—Arthaśāstra (trans. by Shāmaśāstry), pp. 98, 105, 107 and 110.

<sup>3</sup> Whitehead, R. B.—The Pre-Mohammedan Coinage of North-western India, p. 40.

<sup>4</sup> Macdonald, G.—The Evolution of Coinage, p. 6.

Greeks of Asia Minor introduced the next improvement when they 'substituted the engraved die for the primitive punches'.<sup>1</sup> The Indians became gradually familiar with the western coins and by the 5th century B.C. they imitated the Gorgon Type coins of Eretria (cf. the Rākshasa Type coins of Taxila),<sup>2</sup> and the Athenian 'owls' and the Persian 'sigloi' came to India in the course of commerce.<sup>3</sup> Whether the Indians evolved the system of dies, independent of foreigners or adopted it from foreign countries is a subject of controversy among the numismatists.<sup>4</sup> There is no reason why the Indians should not have hit upon this device in the course of evolutionary processes as in the West, though it is clear that in the Punjab region, the influence of the foreign system must have been considerable. Moreover no general statement can be made about the monetary condition of the whole country, for we find that even under the Mauryas, the punch-marked system prevailed in the eastern part of the country, while in the Taxila region the die system had contemporaneously come into use. So we can very well infer that in some parts of the country such as the Punjab, it was under the influence of the foreign coinage that the die system replaced the older practice of punching the coins. By the time the Northern Indian Tribes began to issue coins with regular devices and occasionally with inscriptions, they had definitely adopted the die system. At first the device was on one side only, but gradually the double-die system came into vogue. The dies were at first square or rectangular, the traditional shape of the indigenous Indian coins. Gradually however with the introduction of the circular shape for the coins, the dies also were shaped accordingly. This will be evident by a comparison of the two Aśvaka coins in Cunningham's Plate II, figs. 14 and 17.

The blanks were prepared either by casting the metal pieces or by hammering them, which were then die-struck either on one side or both. Another practice was to have the coins wholly cast; the devices being sunk in the moulds. In the Kupinda coins we find the specimens of all the three processes. The general practice however was to have the coins die-struck on hammered blanks. At first however the device did not cover the whole face of the coin and 'the impress of the die is enclosed in a deep incuse square or circle' (cf. the Aśvaka coins Nos. 9, 10, 13 and 14—Pl. II, Cunningham).<sup>5</sup> This is due to the fact that the coins were struck with dies in a semi-molten condition. It

<sup>1</sup> Head, B. V.—*Coins of the Ancients*, p. 1.

<sup>2</sup> Chakraborty, S. K.—*A Study of Ancient Indian Numismatics*, p. 212.

<sup>3</sup> *Cambridge History of India*, Vol. I, pp. 343, 386-390.

<sup>4</sup> Bhandarkar, D. R.—*Ancient Indian Numismatics*, p. 40.

<sup>5</sup> Rapson, E. J.—*Indian Coins*, p. 14.

is sometimes difficult to recognise the exact system of manufacture as regards individual coins.

Casting was a very old practice in India dating from the 5th century B.C.<sup>1</sup> and it was generally employed when the alloy was very poor and the blanks could not stand the shock of being struck by the hammer. The moulds as in other countries were perhaps of iron, stone, or in most cases terracotta, the latter having been found in several excavations. Sometimes a number of coins were manufactured at a single casting, the different forms being joined by narrow channels for the passage of the heated metal.<sup>2</sup> The ancient dies were perhaps of bronze, iron or steel like those of the Greek or Roman times and it is evident that the two types on the two sides of the same coin are not parallel to each other but lie at an angle to one another. This proves that the two dies were not held together in a hinge.

The chief means of depreciating the coinage was to increase the amount of alloy by the state, thereby bringing down the real value below the face value. The coins of brass or pale bronze, many specimens of which are included (in Smith's catalogue) among the Rājanya and Kuninda coins, are perhaps the result of a conscious attempt at depreciation. But this practice could easily be detected and a clever device was sometimes employed viz. of plating the coins. Copper coins were dipped in silver and passed off as silver coins. It is doubtful whether this device was adopted by the state, or dishonest forgers were guilty of such a practice. This was a very easy method of deception but the old bankers always tested the coins by striking them with a sharp piece of metal. As a result many coins are found covered with shroff-marks which interfere with the correct reading of the legends or proper identification of the type. This practice seems to have been very prevalent during the Pathan period.

The Aśvaka coins and a specimen of the Uddehika coins are single-die struck, the rev. being blank; consequently these are likely to be older than the other tribal coins which were double-die struck. This new system of manufacture gradually stereotyped the shape of the coins as circular. The traditional rectangular shape gave place to the circular, the angular corners being always an inconvenience. The transition is exemplified by the specimens of the Aśvaka coins. The earlier ones (Nos. 9, 11 and 14) are rectangular or roughly square, while the latest (No. 17, Cunningham, Pl. II) is circular. The coins of the Audumbaras, the Kulūtas, the Kunindas and their branch located near Almora, the Sibis, the Vimakas, the Vrishnis, the Uddehikas, the Rājanyas, the Mahārāja Janapada, the Nāgas and the Yaudheyas issued circular coins only. The Mālavas

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<sup>1</sup> Brown, C. J.—The Coins of India, p. 18.

<sup>2</sup> Cunningham, Sir A.—Coins of Ancient India, Pl. I, figs. 24 and 25.

however could not shake off their fascination for the rectangular or square shape. They issued circular coins, side by side, with rectangular ones of a very irregular shape. The square shape however now and then asserted itself even up to the late Muslim times. We have square coins of the Malwa Sultans, of Shah Jahan and of Rājēśwara, king of Assam in the 18th century A.D. (1751–1769 A.D.). But the comparative ease with which the circular coins were manufactured under the die system gradually led to the supplanting of the older shape, and the commonest shape for coins became circular in India also. The Mālavas had some circular coins too (Smith's catalogue—Pl. XX and XXI) but it is evident that generally they did not care much about regularity of shape (cf., Pl. XX, Nos. 15, 16, 17 and 24 and Pl. XXI, Nos. 2, 3, 4 etc.).

The size of the coins was not uniform. The standard coins were generally .6 to .7 inch in diameter, except those of the Mālavas and the Nāgas. The three Ārjunāyana coins (C. CAI., p. 89 and S. CCIM., p. 166) are .6 to .65 and .67 in diameter, the circular Aśvaka coin in Smith's catalogue has a diameter of .9 inch; and the Audumbara coins varied from .6 to .75, the silver coin (Cunningham, Pl. IV, fig. 1) had a diameter of .7 inch. The Kulūta coin (Cunningham, Pl. IV, fig. 14) is .75. The silver coins of the Kuṇindas varied from .65 to .75 inch, while the copper coins from .6 to 1.12 inch. Nos. 13 and 36 in Smith's catalogue are the largest pieces, one being 1.12, the biggest in the collection and the other of Chatreśvara type 1.01 inch in diameter. The coin of the Mahārāja Janapada (Cunningham, Pl. IV, fig. 11) has a diameter of .75 inch, while that of the Vimakas (Cunningham, Pl. IV, fig. 6) is .7. The Vṛishṇi coin (Cunningham, Pl. IV, fig. 15) is .6. The Rājanya coins had a diameter from .65 to .83. The Yaudheya coins are generally big in shape. The Bull: Elephant type coins of the Yaudheyas in Smith's catalogue are .7 to .8 inch; the Brahmanya type from .97 to 1.12 inch and the latest of the Yaudheya coins are generally big, from .9 to 1.05 (Smith No. 25). It therefore appears that the later coins are generally bigger in shape and heavier in weight. The coins of the Mālavas and the Nāgas, however stand by themselves. The Nāga coins in Smith's catalogue varied in size from .3 to .45 inch only. The Mālava coins hold the record for their diminutive size and it is strange how they remained in circulation for centuries. These coins were 'confined to Nāgar and the immediate neighbourhood',<sup>1</sup> and testify to the low economic condition of the people and perhaps want of commercial intercourse with the neighbouring peoples and tribes. Some of the coins are mediocre in size e.g. No. 3 in Smith's catalogue is .62 in diameter, but the vast majority are very small and are generally only  $\frac{1}{2}$  of an inch.

<sup>1</sup> Smith, V. A.—Catalogue of Coins in I.M., p. 162.

One of the Mālava coins in the Indian Museum in Calcutta is only .2 inch in diameter and 1.7 grs. in weight and 'it may claim the honour of being one of the smallest coins in the world'.<sup>1</sup>

### THE LEGENDS.

The Types or devices on the coins came to be gradually accompanied by inscriptions. At first the legends occupied a subordinate position, but later on they sometimes supplanted the types. There is no doubt that the inscriptions came to be put on the coins for the purpose of 'explaining or interpreting the device'. The earliest inscribed coin in the West was found at Halicarnassus.<sup>2</sup> This electrum coin was perhaps struck at Ephesus in the 6th century B.C. It bears a legend meaning—'I am the badge of Phanes', round the Type of a feeding Stag. So it is evident that the legend has a reference to the badge : but sometimes the reference is to the coin itself.

The coin-legends have preserved for us the names of kings and tribes of whom we have no other record, and we derive much help not only in reconstructing the dynastic lists and in determining the chronology but also in fixing 'the geographical extent of the ruling powers'.<sup>3</sup> The Vimakas and their king Rudravarma, the Audumbara king Dharaghosha, the Kulūta king Vīrayaśas and many others are known only from the coins.

The earliest inscribed coins of India date from the 3rd century B.C. The chronology is determined mainly on palæographical considerations. In some of the *sigloi*, dating from the 4th century B.C. or earlier certain characters have been read as Brāhmī and Kharoshthī letters.<sup>4</sup> But full inscriptions are found on the coins of the Aśvakas and the Uddehikas dating from the 3rd century B.C. e.g. *Vaṭasvaka* (coin of the Aśvakas) *Udehaki* (Prince of the Uddehikas). Among the Aśvakas, this innovation is clearly marked. In No. 14 (Pl. II, Cunningham) we have the Type—'A Human Figure with two Hill Symbols on two sides', but in No. 17 (Pl. II—Cunningham) the Hill Symbols on the two sides are arranged one above the other, the human figure with a *svastika* below is placed on the right, and the left field is filled with the inscription in bold and clear Brāhmī letters. The coin of Upagaṇḍa with the legends *Upagaṇḍasa* in early Brāhmī script is according to Bühler at least as old as 350–400 B.C. or before the Mauryas. Inscriptions dating from the 3rd century B.C. are found in the coins of Ayodhyā, Mathurā and Tripurī :—*Viśākhadevasa* (of Viśākha-

<sup>1</sup> *Ibid.*, p. 163.

<sup>2</sup> Head, B. V.—*The Coins of the Ancients*, p. 4 (No. 7).

<sup>3</sup> *Cambridge History of India*, Vol. I, p. 61.

<sup>4</sup> Rapson, E. J.—*Indian Coins*, p. 3.

deva) in Ayodhyā; *Uṇṇikā* in Mathurā and *Tripurī* (in modern Tewar). The earliest inscribed coin from Ujjain dates from the 2nd century B.C., the legend being *Ujjenīye*—‘of Ujjain’, the name of the city in its Prākṛit form. So it is evident that legends began to appear in Indian coins in the 4th century B.C. and became common in the 3rd century B.C. In this connection the question arises whether the practice was indigenous or of foreign origin. Prof. Rapson is of opinion that legends on Indian coins ‘appear as the result of Greek influence in the north-west’.<sup>1</sup> We know that the Athenian, Seleucid and Bactrian coins came to this country in the course of commerce and coins of Alexander and Philip Arrhidaeus<sup>2</sup> have been excavated recently at Taxila. When we take this in connection with the fact that the mighty Maurya Emperors went on with the traditional system of punch-marked coins without inscriptions, a strong presumption naturally arises that they looked upon inscribed coins as a foreign innovation. Prof. Rapson thus seems to be substantially correct in taking the inscriptions on Indian coins as due to foreign influence.

The legends assume various forms—(a) genitive of a tribal or denominational. (b) personal or (c) place name; and the reference is to the nation or tribe, the king or the place named. On rare occasions the reference is undoubtedly to the Type or device. To the first class pertain the following legends—*Ārjunāyanāna* (of the Ārjunāyanas), *Mahārāja Janapadasa* (of Mahārāja Janapada), *Mālaraganaṣya* (of the Mālava gana), *Mālavānām* (of the Mālavas), *Rājajña Janapadasa* (of the Rājanya Janapada), *Yodheyāna* i.e. Yaudheyānām (of the Yaudheyas), *Odumbarisa* (of the Audumbaras) etc. In some cases we have a reference to the chief town of the tribe e.g. *Majhimikāya Sibi Janapadasa* (of the tribe of the Sibis of Madhyamikā), or a reference to the province where they dwelt e.g. *Bhūpadhanusha* (of the Lord of the Desert) in the Yaudheya coins pointing out the region where the tribe was located. In the second class, we have the legends—*Sivadatasu* (of Sivadatta), *Raño Ajamitrasi* (of king Ajamitra), *Raño Mahimitrasi*, (of king Mahimitra), *Magajasi* (abb. for Mahārāja Gajasi (of Mahārāja Gaja), *Maharaja Sri Deva Nāgasya* (of Mahārāja Deva Nāga) etc. To the third class, we may relegate such legends as—*Kaḍasa* (of Kaḍa), *Upagodasa* (of Upagauḍa), *Ujjenīye* (of Ujjain) etc. Though the ordinary practice is to have the tribal, personal or place names in the genitive, there are many cases where the names are in the nominative e.g. tribal name—*Malaya*, *Mālaya* or *Malava*, personal names—*Mala*, perhaps the name of a king—the founder of the Mālava tribe, the names of the Mālava kings or chiefs—*Bhapaṃyana* or *Bhampāyana*, *Yama* or *Maya*

<sup>1</sup> *Cambridge History of India*, Vol. I, p. 61.

<sup>2</sup> *Archæological Survey of India*, 1924-25, pp. 47 and 48.

*Jamapaya*, *Paya*, *Mapaka* (Mahārāja Paka ?), *Magachha* (Mahārāja Gachha ?) and others, and Mahārāja *Sri Gaṇendra* of the Nāgas etc. ; *place* names—*Tripurī* and others. In the case of the Uddehikas the legend is peculiar ; the prince of the tribe is referred to by a noun which is ultimately derived from the tribal name e.g. *Udehaki* (the Prince of the Uddehikas). The legend is thus connected with the coin 'in some vague sort of way'. While ordinarily we find the inscription by the side of the type, in the case of the Mālavas, perhaps for want of space, due to the small size of Malava coins, the legends appear on one side, and the Type on the other. In some of the coins of the Aśvakas and the Yaudheyas, the legends directly refer to the coins themselves e.g. *Vatasvaka* meaning the coin (*vaṭa*) of the Aśvakas or in the Yaudheya coins—*Brahmanyadevasya drama* (the dramma or coin of Brahmanyadeva) i.e. dedicated to the tribal god Kārttikeya, whose figure serves as the type and appears by the side of the inscription.

The Audumbaras, the Kulūtas, the Kuṇindas, the Vimakas and the Vṛishṇis had their tribal names as well as the names of the ruling princes side by side in the legends e.g. the Audumbara legend.—*Mahadevasa Raṇa Dharaghoshasa Odumbarisa* ; the names of the two kings Rudradāsa and Śivadāsa spelt as Rudradasa and Śivadasa are introduced in the legends without any change. The Kulūta inscription is *Rājña Kolutasya Vīrayasasya* (of king Vīrayasas, the Kolūta) : the reference might be to the coin or the Wheel Type by its side. Similar might be the interpretation of the Kuṇinda inscription which we may take to refer to the coin or the Type—*Amaghabhūta maharajasa rājña Kuṇadasa* . (coin of Amoghabhūti Mahārāja, Rājā of the Kuṇindas). The Vṛishṇis had a peculiar legend—*Vṛishṇi Rājajñā gaṇasya tratarasya* (of the Vṛishṇi Rājanva (and) Gana—the Protector of the country—Jayaswal).<sup>1</sup> Here the head of the state is not referred to by name but by the official title *Rājanya*. The descriptive word *tratarasya* is rather unique, perhaps borrowed from the legends of some of the Indo-Greek kings who took the title of Soter—Apollodotos, Diodotus II. Diomedes, Dionisios, Hermaios, Minander and Nikias. In the coins of Diomedes the reverse legend in Kharoshthī is *Maharajasa tratarasa Diomedasa*,<sup>2</sup> or *Maharajasa tratarasa Apaladatas*<sup>3</sup> in the coins of Apollodotos ; and similar such legends of other kings who were perhaps contemporaries with the Vṛishṇis.

In some cases the legends refer to the patron saint or the national god whose figures appear by the side of the inscriptions. In one class of the Audumbara coins, we have the full legend and across the field *Viśpamitra* (Viśwāmitra) which refers

1 *JRAS.*, 1900, p. 416 (A. V. Bergny) ; *J.H.P.I.*, p. 157.

2 Smith, V. A.—Catalogue of Coins in I.M., p. 16.

3 *Ibid.*, p. 18.



to the standing figure of the Rishi, with right hand raised and the left resting on the waist. Evidently Viśvāmitra was the patron saint of the Audumbaras. There are also some coins which are dedicated to the national gods by the tribes concerned. The Elephant and Bull Type coins of the Audumbaras have the legend—‘*Bhagavato Mahādevasa Rājarājasa*’—‘in the name of the Almighty Mahādeva, the king of kings’. The Chatreśvara Type coins of the Kupindas are dedicated to the national god Mahādeva in the form of Chatreśvara. On the *obv.* we have Śiva facing with Trisūl in right hand and leopard skin hanging from the left arm, and Brāhmī legend ‘*Bhāgavata Chatreśvara Mahātmanah*’—of the Almighty Mahādeva (Chatreśvara), the great-souled’ there being evident connection between the legend and the Type. The Yaudheyas were warriors per excellence and Brahmanyadeva or Kārttikeya, the War-god was taken by them as their national god, and some of their coins were dedicated to him. The Brahmanyadeva Type coins have on the *obv.* the six-headed god (Kārttikeya) standing on lotus, facing with left hand on hip, and right hand raised and a barbed spear on the left; the full legend is *Bhāgaratah svāmīno Brahmanyadevasya*. ‘Of the Divine Lord Brahmanyadeva’. In some specimens *Brahmanyadevasya* is replaced by *Kumārasa*, Kumāra being another name of Kārttikeya and all our doubts about the dedication of these coins to the War-god Kārttikeya are set at rest. So it is evident that whenever there was any risk of being misunderstood, the die-engraver added a descriptive title to clear up the point. In Rome and in some Greek cities, the statues of divinities had their names attached. The best known example is Kimon’s Arethusa in the fine Syracusan coins of c. 400 B.C. In the tribal coins however we do not meet with the portraits of the ruling chiefs: evidently portrait heads had not yet come into use, though in the west the heads of the kings were already introduced on the obverse.

Another class of legends are put up on the coins as the mottos of the different tribes—*Arjunāyanana Jaya*, ‘Victory to the Arjunāyanas, *Mālarānān Jaya* etc., *Mālaraganasya Jaya*, ‘Victory to the Mālava gana’, *Yadhayaganasya jaya* i.e. Yaudheya ganasya jaya or ‘Victory to the Yaudheya gana. In some of the Yaudheya coins occur the numerals *Dvi* and *Tri* in letters and not in figures. These are supposed to refer specifically to the 2nd and the 3rd clans of the Yaudheyas who were obviously divided into three sections.

When the legends first came into use the coins were generally of the single die variety. Consequently the die-engraver had two courses left to him, either to put the inscription by the side of the Type, or to shift it on the reverse to stand by itself, the latter alternative being perhaps the later practice. In the Aśvaka coin (Cunningham, Pl. II, No. 17), the inscription *Vaṭasvaka* is put horizontally on the left hand side in the place

of one of the Hill Symbols. We find the same practice in the early coins of the 2nd or 3rd century B.C. e.g. in Mathurā, the coin with the legend, *Upātikyā*, below the *Svastika* Symbol; in the Tripurī coin, the legend—*Tripurī* accompanied by the 3 symbols *Svastika*, River and Hill; in the Upagauḍa coin, the legend *Upagodasa* with the symbols 'circle' and '*nandipada*'—in all these cases the reverse is blank. In a coin from Eran, occurs the legend alone without any Type, and the arrangement of the letters is peculiar—these are arranged from right to left, and this coin is supposed by some of the scholars to be the oldest inscribed coin in India as the letters in the legend *Dhamapālāsa* are in a very ancient Brāhmī script. The second device is found in a coin from Ujjain of the 2nd century B.C.—the Elephant on the obv. and the legend on the rev.—*Ujeniye* (of Ujjain); the reference might be to the coin or the Elephant which was perhaps the badge of the city. Many such cases occur in the Mālava coins e.g. in No. 13 (Smith's catalogue), the legend covers the obv., and on the rev. occurs a Vase (loṭā) in dotted circle. This practice is found in the coins included by Smith in Groups 2, 3, 4, 5 and 6, and also in class B. coins, with the names of chiefs on the obv., and on the rev. the Lion, Elephant, Humped Bull, and other Types.

In some cases, the Mālavas divided the legend in two parts and placed them on the two sides of the coins. One part of the legend stood by itself, while on the other side, the second part was accompanied by a Type or Symbols. But in a few cases, there are Types or Symbols on both the sides and the inscription is divided between the two. The coin No. 1 in Smith's catalogue has on the obv. the word *Jaya* and on the rev. *Mālavānām* accompanied by two symbols; No. 11 has on the obv. Hill symbol and the legend *Jaya*; and on the rev. two symbols with the legend *Mālavāṇa*. The Mālavas were perhaps compelled to adopt this device on account of the small size of the coins, and this will also explain the irregular arrangement of the letters of the inscriptions. Sometimes they are arranged in a circle or in two lines, or two groups of letters are placed on the two sides of the same Type. But on bigger coins the legend is arranged in a circle round the principal Type on the obv. e.g. among the Arjunāyanas, the Kunindas (Chatisvara Type), the Rājanyas, Yaudheyas and others. The Audumbaras, the Kunindas (Amoghabhūti Type), the Kulūtas, the Mahārāja Janapada, the Vimakas, the Vṛishṇis had the same legend on both the sides—in Brāhmī alphabet on one side and in Kharoshthī on the other; and the legends are arranged in a circle round the Types or Symbols. The coins with only legends on both the sides, without any Type or Symbol are very rare—one circular coin is reproduced in Cunningham, Pl. II, No. 21 and rectangular ones in Pl. III, Nos. 8 and 10. While in the first one the same legend occurs on both the sides, in the two others occur the word

*Negamā* on one side and their names on the other viz. *Tālimata* and *Dojaka*.

The coins under discussion are not dated, the only means of determining the approximate Chronology being the forms of the letters and the language of the inscriptions. A study of the language and the alphabets used in the legends enables us to determine the approximate chronology of the coins and the rulers and tribes named therein. There is no doubt that the Brāhmī alphabet was in general use throughout the country. This was the alphabet in use among the *Ārjunāyanas*, the *Mālavas*, the *Nāgas*, the *Āsvakas*, the *Sibis*, the *Uddehikas* and the *Yaudheyas*. Brāhmī accompanied by *Kharoshthī* on the other side is found among the *Audumbaras*, *Kuṇindas* (*Amoghabhūti* Type), *Kulūtas*, *Vimakas* and *Vṛishnis*, while in the coins of the *Rājanya* and *Mahārāja Janapada* and some of the *Kuṇinda* coins, the two alphabets are not used together in the same coin but some have only Kh. and others Br. The Indian home of Kh. lay in 'eastern Afghanistan and in the north of the Punjab',<sup>1</sup> but it appears side by side with the Br. 'as far as Bhawalpur in S-W, Mathura in the S. and Kāngrā in S-E'. It is said to be derived from the Aramaic script<sup>2</sup> and was introduced in this country perhaps in the 6th century B.C. when the Punjab was under the Persian Rule. In the third century B.C. the Asokan inscriptions in the North-West region were in Kh. In the meantime the alphabet had been modified and additional sounds to represent the Indian languages had been introduced: but the result was not fully satisfactory. This is evident from the bilingual legends of the *Audumbaras* viz. *bhugurusa mahaderusa rajarañā*. There is no doubt that the tribes using Kh. and Br. alphabets simultaneously in their coin-legends lived in the border region between the two districts using Br. and Kh. as their regular alphabets. A Chronological clue is afforded by the Kh. legends in the tribal coins. Prof. Rapson points out that in the bilingual coins, the legends became curtailed with the lapse of time.<sup>3</sup> At first the Kh. inscription is full but it is gradually curtailed, though the Br. legend remains complete on the other side. In the *Kulūta* coin of the 1st or 2nd century A.D. the Br. legend—*Rājña Kolū-tasya Vīrayaśasya* on the obv. is complete, but on the rev. occurs only the title *Rañā* and the rest of the legend is omitted. A reference to the *Kuṇinda* coins (*Chatreśvara* Type) shows that by the 2nd century A.D., Brāhmī asserted itself and by the 3rd century A.D. Kh. fell completely into disuse, though recent

<sup>1</sup> Rapson, E. J.—Catalogue of Coins of the Andhra Dynasty, etc., p. CIV.

<sup>2</sup> *Cambridge History of India*, Vol. I, p. 62.

<sup>3</sup> *JRAS.*, 1900—Rapson—"The *Kulūtas*, a people of Northern India'.

discoveries at Taxila clearly prove that 'it was in use there until at least the middle of the 5th century A.D.'<sup>1</sup>

At first the language of the inscriptions was Prākṛit or the popular dialect of the time ; of which the chief characteristic was the avoidance of 'harsh consonantal combinations' e.g.—*Ujjenīye*, 'of Ujjain' ; *Vatasvaka*, (*Aśvakānām Vataḥ*) ; *Yodheyana* (*Yaudheyānām*) ; *Majhimikāya Sibi Janapadasa* ; *Mālavāṇa Jaya*, *Mālavāṇa Jayu* etc. ; *Raṇa Kupidasa Amoghabhatisa Maharajasa* and such others. But by the second century A.D., the legends were generally in classical Sanskrit. The change from Prākṛit to Sanskrit is found among the Mālavas and the Yaudheyas. The *Mālavāṇa Jaya* or its variants *Mālavahṇa Jaya* etc. gave way to *Mālavānām Jaya* or *Yodheyana* is replaced by *Brahmanyadevasya drama* or partially sanskritised form *Yadhayaganasya Jaya*. Legends in correct classical Sanskrit is very rare. The tribes at first put the legends in the popular dialect but gradually adopted classical Sanskrit for the purpose. Mr. Bergny gives some Sanskrit forms for the old Prākṛit ones, found on the coins. But the attempt seems to be an intellectual gymnastics, for it is sure that the classical forms were never in use and the literary language was later than the various forms of Prākṛit used in the legends of the coins. But the linguistic changes have some chronological value and are an additional help in the determination of chronological sequence of the coins under discussion.

### THE SYMBOLS.

Prof. Rapson points out that in ancient Indian Numismatics, there is no permanent distinction between Types and Symbols. 'In regard both to their origin and their use they probably had much in common, and the terms are often applied to the same designs according to the relative position of predominance or insignificance which they seem to occupy on a coin'.<sup>2</sup> The symbols which generally occurred in the punch-marked coins are found repeated in the later coins ; and one of them occupies a prominent place and is taken as the Type ; the others are regarded as symbols.

It is true that 'in their essence they are heraldic',<sup>3</sup> but their origin is generally shrouded in mystery. We have two words *Aṅka* and *Lakṣhaṇa* associated with Saṅghas in Pāṇini. Jayaswal takes the *Lakṣhaṇa* to be the *Lāñchhana* or 'heraldic crest of later Sanskrit', and as a result of his discussion, he takes the *lakṣhaṇa* to be the 'royal' or 'state' mark, and the *aṅka* 'the individual mark' of a prince, and may mean even the legend or

<sup>1</sup> *Cambridge History of India*, Vol. I, p. 657.

<sup>2</sup> Rapson E. J.—The Catalogue of Coins of the Andhra Dynasty, etc., p. CLXXV.

<sup>3</sup> Macdonald, G.—The Evolution of Coinage, p. 76.

the motto adopted by a ruler'.<sup>1</sup> The *lakshana* is therefore to be taken as the State Symbol and as it occupied the prominent place—the 'Type, while the *anka* which varied with the heads of the State, was the individual mark of the ruler, and consequently occupied a subordinate position and may be denominated a 'Symbol'. There is no reason to take the legend as the *Anka*, though sometimes, it might take the place of a Symbol and serve its purpose. The main distinction seems to be that *lakshana* is *national* and *anka* *personal* in significance.

In the earlier stage when the punch-marked coins were in circulation, the symbols impressed upon them had various significance. Mr. Walsh after a detailed discussion about the punch-marked coins discovered at Patna and Ghoroghat formulates his opinion as follows 'It may be suggested, to account for a constant group of marks, that one mark may represent the state, one the reigning king, one the place where the coin was struck, and perhaps one a religious mark recognising the presiding deity; also the master of the mint may have had his mark, which would fix his responsibility for the coin, and the additional varying marks may have been those of the *Saṅghas*, village communities, in which the coin was current, affixed at the time the *rupiya* or the local tax on it was levied on its admission to circulation in that jurisdiction. And the various and unsystematic punches on the reverse would appear to have been the marks of private shroffs and moneyers through whose hands the coin passed in the course of circulation'.<sup>2</sup> If we had only a clue to the significance of these symbols, we would have been in a position not only to identify the coins and their provenance but also the rulers to whom they are to be ascribed. On occasions, however, inspite of the obscurity about the origin and significance of the coin-symbols, it is possible to determine 'whether their use was local, dynastic or personal—that is to say, whether they were intended to denote some particular locality, some particular family of rulers or some particular ruler'.<sup>3</sup>

The significance of all the symbols used, cannot be determined in the present state of our knowledge, and it is doubtful whether the past will yield up the result so much sought after. But these symbols are of great importance to us 'as authoritative records of the symbolism—religious, mythological and astronomical current throughout India for many centuries'.<sup>4</sup> The number as enumerated by Mr. Theobald was more than three hundred and new discoveries have increased it appreciably. So the total is about 400, though one and the same symbol

<sup>1</sup> J. HP. I., pp. 43 and 44.

<sup>2</sup> Walsh, E. H. C.—Cent Sup. JRAS., 1924, p. 184.

<sup>3</sup> Rapson, E. J.—The Catalogue of Coins of the Andhra Dynasty, p. CLXV.

<sup>4</sup> Smith, V. A.—Catalogue of Coins in the Indian Museum, p. 131.

might have been represented in different ways in the various coins.

Theobald classified the symbols under six heads<sup>1</sup>: (I) human figure; (II) implements, arms and works of men, including the *stūpa* or *chaitya*, bow and arrow, etc. (III) animals; (IV) trees, branches and fruit; (V) symbols connected with solar, planetary or Sivite Worship; (VI) miscellaneous and unknown'. This classification is however superficial and does not take into account the import or real significance of the devices employed. They were the *aṅkas* or emblems of the different states or tribes, but the main point for determination is the reason that led to the adoption of a certain device by a particular people. It may be possible in the case of some of the states, but in the majority of cases our information is not complete. The Udumbara tree in the coins of the Audumbaras is a 'Canting Badge' of the tribe concerned (i.e. a punning allusion to the name of the tribe), the 'Warrior' in the Yaudheya coins represents military prowess, Brahmanyadeva in others was evidently their national God, like Athena in Athens; the Bull or Elephant signifies power, the trident or umbrella denotes empire, or royal dignity, the Vajra or thunderbolt and Spear stood for 'armed might', and so on. To unravel the mystery, where it is possible, requires a reference to ancient architecture, sculpture and ancient records on stone or copper i.e. epigraphic materials.

The 'canting badges' were very common. This practice prevailed to some extent in the West. Cunningham gives a number of examples in India but many more may be pointed out. The punning allusions may lie to the (a) state or tribe, (b) the name of the King or ruling chief, or (c) private individuals like mint-masters: (a) a calf (Sk. Vatsa) by the Vatsas; an armed soldier (Sk. Yoddhā) by the Yaudheyas, Udumbara tree by the Audumbaras; a snake (Sk. Ahi) by Ahicchatra etc.; (b) among the Kings of Pañchāla this practice was very popular e.g. the God Agni, a male figure with five-rayed head in the coins of Agnimitra, the Sun in the coins of Bhānumitra (Sk. Bhānu, the Sun), the image of God Indra in the coins of Indramitra or the constellation Phalguni in the coins of Phalgunimitra; (c) 'the Sun' for Sūryadās; a 'Snake' for Nāga Sen; and an 'Elephant' for Gaj Sinh. Bir Deo might have had a 'soldier', Gopāl a Bull, and Khajur Varma a 'Palm' tree (Khajur).<sup>2</sup> Such examples can be easily multiplied.

Another class of symbols has to be referred to certain peculiar features of the land to which the coins belonged i.e. a certain Hill, River or Lake. The so-called *Chaitya* is nothing but the *Hill Symbol* and the system of representation of a Hill by a number of semi-circles, or circular balls, arranged in rows

<sup>1</sup> *Ibid.*

<sup>2</sup> Cunningham, Sir A.—Coins of Ancient India, pp. 56-58

above one another and tapering to a point is also found outside India, for example, in Crete.<sup>1</sup> We are indebted to Dr. Bhandarkar for this identification. Naturally the treatment varied in the case of the different tribes or states. Each had a variety of this symbol which had an intimate connection with the locality which could consequently be easily identified. It may be that the Hill that appeared in the coins was perhaps the chief characteristic of the locality, or specially connected with the national life of the people concerned. The Āśvakas had two Hill symbols in their coins, represented in two different ways, and therefore may be supposed to stand for two Hills which were situated in their territory, or recognised as sacred by them. One Hill has been characterised as a pile of Balls—10 Balls arranged in four rows, one row above the other, the number of balls diminishing by one. The other Hill symbol is of three semi-circles, one above the other two, the whole surmounted by a crescent. The various forms that this symbol took may be seen in the Ghoroghat coins.<sup>2</sup> A curved line is also found on many coins. But it is difficult to identify it correctly in all cases. The zigzag line may stand for a river or a snake, and sometimes it may serve merely an ornamental purpose. Identification is possible, specially when it occurs with a Hill Symbol. In that case, the Hill and the River are the special local features. The zigzag line in the Āśvaka coins surely stands for a river, but it is evident that the Audumbaras and the Kunindas used this device merely for ornamental purposes. In the majority of the cases, the symbol stands for a river on which perhaps the capital stood, or which was deemed sacred by the people, or happened to be the most important means of communication. In some of the coins, the river is represented by two curved lines with fish between.

Another class of symbols refers to the majesty of the State. The chief example is the Three-Umbrellas<sup>3</sup> symbol in which the three Umbrellas are bound together in the middle. The Umbrella (*chhatra*) is always an insignia of royalty and signified the majesty of the state. Another symbol which is generally identified with the Sun is really the *Chakra* (discus),<sup>4</sup> and stands to signify the authority of the state. The national Standards also figure in the coins. The Audumbaras appear to be very fond of their tribal insignia and three different varieties are employed by them. In their Viśvāmītra type coins, occurs their national standard—a trident battle-axe i.e. a Trīśūla and Axe combined. In the Elephant : Temple type there are two

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<sup>1</sup> Cotterill—Ancient Greece (Earth Goddess and Lions from Crete), p. 50.

<sup>2</sup> *The Journal of the Bihar and Orissa Research Society*, Dec., 1919, pl. III, Nos. 3-3c.

<sup>3</sup> *Ibid.*, Nos. 1-1e.

<sup>4</sup> *Ibid.*, No. 2.

pillars on the two sides of the temple, the left one has a Swastika on it, and the right one is surmounted by what appears to be a wheel with 'pendant garlands'. The association of these two symbols with a temple, stamp them with a religious character, and they were perhaps looked upon as objects of veneration. The Yaudheyas had also their national standard figuring in their Bull: Elephant type coins.

Hinduism declares 'the ultimate truth to be unknowable and undefinable' and endeavours to approach reality by the use of 'suggestive type or symbol'.<sup>1</sup> Consequently Hinduism makes much use of symbolism. The most numerous section of coin-symbols has some kind of religious significance. The symbols stand for (I) national deities or patron saints, (II) their vehicles (Vāhanas)—birds or animals, (III) their special weapons, or (IV) objects or trees specially sacred to them. The Vāhanas are the symbols of the presence and power of the Gods e.g. Hamsa or goose of Brahmā, Makara of Varuṇa, Garuḍa of Viṣṇu, the peacock of Kārttikeya, the deer of Vāyu, the elephant Airāvata of Indra, the buffalo and the dogs of Yama, the Monkey of Hanumān and the Bull of Śiva. The Trīśūla is sacred to Śiva, the emblem of his authority, and the crescent on his head stands for his sovereign power, the *chakra*, *gadā* (club) and the *conch-shell* are sacred to Viṣṇu, and *Vajra* or Thunderbolt to Indra and so on. The Tulasi tree is sacred to Viṣṇu, Bael and Dhuturā flower to Śiva and lotus to Lakṣmī and Sarasvatī.<sup>2</sup>

The animals play a very important part in the Vedic Mythology and religious ideas. The horse draws the cars of the Gods in the Rīgveda and is regarded as an object of worship. The cow assuredly occupies a prominent position in Vedic Mythology and is regarded as sacred in the Rīgveda and is referred to as *aghnyā* 'not to be slain'. The goat draws the car of Pūshan, the ass of the Asvins, and the other animals referred to, are the dogs of Yama and the monkey Vrishakapi, the favourite of Indra. Prajāpati assumed the form of a boar in the Yajurveda and the tortoise came to have a semi-divine position in later Vedas. Ahi, the serpent is the form taken by the demon-Vitra—the enemy of Indra. Snake therefore stands for evil power. Inanimate objects were also deified and treated as deities in the Vedas'. Mountains along with rivers and plants are frequently invoked as gods. Large trees-Vanaspati or lords of the forest are also addressed as gods, the sacrificial implements, the most important of which is the sacrificial post, the weapons like bow, quiver, arrows etc. are deified.<sup>3</sup> The wheel or *chakra* represents the Sun and is the weapon of one of the solar Gods-Viṣṇu.

<sup>1</sup> *Encyclopædia of Religion and Ethics*, Vol. XII, p. 141 (Symbolism).

<sup>2</sup> *Ibid.*, pp. 42 and 43.

<sup>3</sup> *Ibid.*, (Vedic Religion), p. 609.



Plant forms are portrayed in the seals from Mahenjodaro and Harappā, and two of them the Pipal and Babul tree have been identified.<sup>1</sup> The tree cult was very common in ancient India. 'The sacred tree signified universally in primitive ages the presence of the deity'. Different gods came to be associated with different trees. Each Buddha had his own tree; Gautama attained enlightenment under the Pipal tree which is sacred to him. That the tree symbols in ancient Indian coins had a religious significance is attested to by the railing which is always put around, and marks it off as a holy ground, and the tree as an object of special regard. The identification of trees represented in Indian coins is no doubt difficult but it is sure that they were connected with the religious belief of the people concerned. It is to be marked that the practice of putting in railings around a sacred object was common in India e.g. the stūpas, sacred places and trees are always enclosed in architecture and sculpture.

Certain objects are looked upon as specially auspicious in character and they find a place in the coins. These are generally linear and whatever might be the origin, they became so intimately connected with the national life that these symbols are found in works of architecture and sculpture as well as in coins: and were used at the time of religious festivals and on such happy occasions as marriage, birth of a son and so on. The symbols like Swastika, Nandipada and others are very common on coins, in works of sculpture etc. from high antiquity. The circle, the square, the triangle, the dot or dots arranged in various ways, and the geometrical patterns had surely, certain significance: and for their interpretation, we have to take the help of the esoteric side of religion, e.g. a point or dot is the geometric symbolism of God, the Absolute and Unknowable: the equilateral triangle is 'the symbol of God manifested in the cosmos'; the spiral is 'the geometric symbol of evolutionary force' and similar interpretations may be found in the case of many such geometrical or linear symbols. (Havell's—*The Ideals of Indian Art*).

Of the linear symbols, the Swastika is the best known and is even now recognised as an auspicious sign. We find it in the seals discovered in the prehistoric sites of the Indus Valley civilization'.<sup>2</sup> It is found in use in many parts of the ancient world e.g. in Crete, Troy, Susa etc. but not in Babylon or Egypt. It is undoubtedly a solar symbol: and of the various theories that have been propounded to explain its origin, the interpretation of Mr. Havell seems to be the most convincing. The Swastika represents the movement of the sun round the earth; and the earth owes its fertility to its beneficent powers. Man ultimately

<sup>1</sup> *The Indian Historical Quarterly*, March, 1932.

Mohenjo-daro and Indus Valley Civilization, pp. 133, 140.

<sup>2</sup> *Ibid.*, p. 130.

derives his happiness and prosperity to the visible daily passage of the sun through the heavens. The arms of the Swastika are sometimes represented curved, but the ordinary and perhaps the later practice, was to have straight lines as arms, going round from left to right; and this direction was in use in later times. The opposite form from right to left, was looked upon as inauspicious. But at Mahenjodaro, no such feeling seems to have existed. This solar emblem of high antiquity proves the tenaciousness of human belief; and it was in common use in architecture (in town planning), in sculpture, in coinage and in religious festivities. In short it entwines itself with the spiritual and artistic life of the people. Lastly we have a number of symbols which were accepted as *Aṅkas* or *Lakṣaṇas* by the states, tribes or individuals, for no particular reason, except pure fancy. These had no special significance but were taken haphazard as heraldic devices. It is however very difficult to determine whether some of them had totemistic origin. Such symbols might be (a) trees, animals or any other objects or (b) astronomical symbols like the Sun, the Moon, the Crescent or the five-pointed Star. Sun-worship was prevalent from very early times. In the Vedas, *Sūrya* is worshipped under many names and forms, and the most sacred verse of the *Gāyatri* is an invocation to the Sun-God. The three aspects of the sun are the rising, culminating and setting; and this triple aspect is represented by the epithet *tripād*, three-footed and *trivikrama* or three-stepping. The last title came to be appropriated to *Vishṇu*—the sun as the all-pervader who in three strides traverses the three worlds—earth, heaven and hell'.<sup>1</sup> In the coins, the sun is represented with spreading rays—the rising sun; and is a peculiarly auspicious object, the giver of all prosperity and life. The radiate sun and other solar emblems occur in the earliest coinage and also in those of the *Mālavas*. In one case the rays of the solar emblem are bent.

The moon as a crescent figures in the coins of the *Mahārāja Janapada* and the *Yaudheyas* and also in the punch-marked coins. Though there was no worship of the moon in India, yet she is recognised as an object of adoration. In the Vedas, *Soma* is identified with the moon, and its waning is said to be due to the drinking up of the nectar (*amṛita*) by the gods. *Śiva* is *chandraśekhara* 'with the moon in his crest', and the Lunar Dynasty claimed descent from the moon. So we can expect the symbol of the crescent in the coins of the *Saivas* or members of the Lunar Dynasty.

The stars and constellations are recognised by the Hindus either as beneficent or malevolent. The anthropomorphic representation of the *Nakshatra* or constellation *Phalguni* is

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<sup>1</sup> *Encyclopædia of Religion and Ethics*, Vol. XII, p. 83—Sun, Moon and Stars (Hindu).

found in the coins of Phalgunimitra of Pañchāla and the stars figure in the coins with five tapering lines representing the rays.

The number of symbols met with in the tribal coins is more than forty. The animals that figure as such are the Bull, Elephant, Lion and Snake. A Bull occupies the rev. of some of the Rājanya, Nāga and Mālava coins. The Mālava Bull is generally recumbent, while in the case of the Rājanyas and the Nāgas, it is humped. The position is so prominent in these cases that the Bull may be accepted as a Type on the rev. of these coins.

The Elephant is found on the rev. of the Mālava coins and the Lion also occurs in the same position among the Mālavas and Rājanyas. The five-hooded snake has been identified in the coins of the Uddehikas. The peacock of the fantail variety, is common among the Mālavas. The Bird on the obv. of the 'Warrior' type coins of the Yaudheyas has been identified as a cock, and it really appears to be a peacock—the Vehicle or Vāhana of their national god Kārttikeya.

The Tree-in-Railing was a very common symbol and is found not only in the punch-marked coins but also in the die-struck coins of the Kuṇindas, Audumbaras, Yaudheyas, Mālavas and others. The Kuṇinda tree seems to be a pine tree and the representation is conventional—the branches are arranged in three or four rows, and sometimes the leaves are represented by lines looking downwards. The tree in Audumbara coin is surely of the Udumbara variety, though they are differently represented in the two types—the Viśvāmitra and the Elephant : Temple Types.

In the Sibi coin, it rises from a circle while the Uddehikas had the Tree-in-Railing in the horizontal position. The same symbol occurs in one class of the Rājanya coins and is rather common among the Mālavas. The Yaudheyas had the Tree-in-Railing conventionally represented in the Brahmanyadeva group and it may be a deodar.

The flower under the head of the Bull in the Bull : Elephant Type coins of the Audumbaras has been identified as a lotus flower ; it however appears to be a *chakra* or discus and is perhaps a countermark. But among the Mālavas, the lotus flower is sometimes open and is conventionally represented on occasions. It is in some of the Mālava coins that pinnate palm leaf appears side by side with the legend. A symbol which is very common in ancient Indian coins is the so-called *Chaitya* which has been correctly identified by Prof. Bhandarkar to be a Hill Symbol and is represented by a number of balls or crescents arranged in rows above one another and tapering to a point. Naturally the treatment varied in the case of the different tribes. Each had a variety of this symbol which had an intimate connection with the locality and made identification possible. The Hill

that appeared in the coin was perhaps the chief characteristic of the locality or intimately connected with the national life of the tribe or people. The Āśvakas had two Hill symbols in their coins, represented in two different ways and therefore these may be supposed to stand for two Hills which were situated in their territory or recognised as sacred by them. One Hill has been characterised as a pile of Balls—10 balls arranged in 4 rows, one row above the other, the number of balls diminishing by one. The other Hill symbol is of three semi-circles, one over the other two, the whole surmounted by a crescent. In the Kulūta coin the Hill symbol is composed of ten semicircles or arches surmounted by an elaborate Nandipada: the treatment is rather out of the ordinary. The Kuṇindas had a six-arched Hill Symbol with an umbrella above, the uppermost arch is rather elongated. The Yaudheyas had a similar representation of the Hill in their coins. The Sibi Hill is surmounted by a Nandipada and the Mālavas had a Hill of three arches (No. 11—Smith) like the Āśvakas.

The zigzag line occurs in the coins of the Āśvakas, the Audumbaras, Kuṇindas, Sibis, Mālavas and the Yaudheyas. But there is a great difficulty in identifying this symbol. It may stand for a river or a snake, and sometimes it may serve merely an ornamental purpose. The identification is however possible specially when it occurs with a Hill symbol. In that case the Hill and the River are the special local features. The zigzag line in the Āśvaka coins surely, stands for a river and similar is the case with the Sibi coin. It is evident that the Audumbaras and the Kuṇindas used this device merely for ornamental purposes. The Mālavas and the Yaudheyas had the zigzag line in their coins but it is doubtful whether it represents a snake or a river, though Smith identifies some of them as snakes in the Mālava coins. The wavy lines in the Āśvaka coin (No. 9 Cunningham, Pl. II) have been identified as vine branches by Prof. Rapson and the identification may be correct.

A squatting male figure with knees raised is found as a symbol in a Mālava coin (No. 104—Smith). What it stands for cannot be determined. But it is sure that the female figure in the Kuṇinda coins (Stag Type) is that of a goddess or the patron deity of the tribe. The figure stands on the right of the stag, has the left hand on hip and the right hand holds up a lotus stalk with a full blown lotus. (Smith pl. XX, No. 11). In some of the specimens the full-blown lotus is also under the feet of the female figure (Cunningham, Pl. V, figs. 1 and 2). She may therefore be Lakṣmī, the goddess of prosperity and the goddess is also found in the coins of Avantī, Ayodhyā, Eraṇ and Kauśāmbī associated with lotus.

The principal weapons that figure as symbols are the Trisūla, Chakra, and the Vajra. Trisūla is the special weapon of Śiva and is found in Vimaka and Audumbara coins. The Vimaka

trident is of the ordinary shape but in the Audumbara coin the trident is highly elaborate and is perhaps the figure of their standard. The chakra is the special weapon of Vishṇu. It figures as a Type in the Vṛishṇi coin and is used as a symbol by the Vimakas, and the Yaudheyas in their earlier coins. (Cunningham, Pl. VI, fig. 5, obv.). The Vajra is the special weapon of Indra, an important member of the Hindu pantheon and in the Purāṇic period recognised as the king of the gods. It is found in the coins of the Mahārāja Janapada. It has great similarity with the representation of the thunderbolt in the coins of Nahapāna (Nos. 243, 244 etc.—Rapson's Catalogue of Coins of the Andhra Dynasty etc.).

Of the astronomical signs the radiate sun and other solar symbols occur in the coins of the Mālavas. In one case the rays of the solar emblem are bent (No. 64—Smith): the crescent was adopted as a symbol by the Mahārāja Janapada and the Yaudheyas. In the Janapada coin, the crescent is placed over the head of the Bull and as the crescent figures on the head of god Śiva and the Bull is his Vehicle or Vāhana, a strong presumption is raised, as pointed out by Jayaswal, that they were the worshippers of Śiva. The crescent also occurs in one class of Yaudheya coins (Smith—No. 19, p. 182) associated with a stag (or is it a Bull?): on the other side, we have the representation of Brahmanyadeva, a single-headed god, radiate, grasping a spear. Kārttikeya is reputed to be the son of Śiva: so on the rev. we have the crescent and Bull (?) the special insignia of the god Śiva.

The conch-shell is sacred to Vishnu and it is used as a symbol in the coins of the second (*Dri*) section of the Yaudheyas. The Saṅkha or conch shell is even now recognised as an auspicious object and is sounded at the time of marriages and other festivities, and also when worshipping the gods. It also figures in the coins of Gautamiputra and Śrī Yajña of the Andhra Dynasty (Rapson, p. 237). A similar auspicious object is a vase with leaves (āmra-pallavas-mangoe leaves) and was the special emblem of the 3rd section (*Tri*) of the Yaudheyas. This symbol is also found among the Kuṇḍas in their Chatreśvara Type coins where it figures above the Stag on the rev. It is used as a Type by the Mālavas and is sometimes placed within a dotted circle or dotted border.


On occasions the national standards of the tribes figure in their coins. The Audumbaras appear to be very fond of their tribal insignia and 3 different varieties are employed by them. The symbol on the rev. of the Viśwāmītra Type coin to the left of the Udumbara tree is a trident battle-axe—a Trisūla and Axe combined. (Smith—Oxford History of India, p. 64 figs. 9 and 10—the two combined is the Audumbara symbol). The same symbol is found on the rev. of a hemi-drachm of Zoilus (Cunningham, Pl. IV, fig. 3). On the rev. of the Audumbara

coin of the Elephant : Temple Type occur two pillars on the two sides of the temple, the left one has a Swastika on it and the right one is surmounted by what appears to be a wheel with 'pendant garlands'. The wheel is taken to be a dharmachakra by Cunningham. The association of these two symbols with a temple stamps them with a religious character and these were perhaps looked upon as objects of veneration. The Yaudheyas had also their national standard figuring in their Bull : Elephant Type coins,—on the obv. ; the Bull standing right faces a curved object rising from a railing. It may be the tribal standard of the Yaudheyas but the identification of the scythe like object on the rev. which the elephant is passing by, is rather difficult. It may be a standard with a hanging streamer but the device is very obscure. (Smith, Pl. XXI, No. 13).

Of the linear symbols the Swastika is the most well-known and it appears in the coins of the Āśvakas, Kulūtas, the Kuṇindas and the Yaudheyas. The ends of the Swastika in the Āśvaka and Kulūta coins are curved, while the Kuṇindas and the Yaudheya had the ordinary representation. These all turn from left to right which was the general practice in historic times in India. The Nandipada also seems to be very popular. It is found not only in the punch-marked coins but appears in its elaborate form in the coins of the Kulūtas, Vṛishnis, Kuṇindas, Audumbaras, the Yaudheyas and Mālavas : and in its so-called Taurine form among the Āśvakas. The Mālava symbol also called the 'Ujjain Symbol' is found in the coins of the Mālava region and naturally appears in the coins of the Mālavas. It is also found in the coins of the Yaudheyas, Uddehikas and others. Perhaps it is a solar symbol and was in extensive use in early times. Two other symbols of doubtful origin may be mentioned here. One is the Triangular-headed Symbol which appears in the coins of the Uddehikas, the Yaudhevas and the Almora branch of the Kuṇindas. It is identified with the 'handled cross'.<sup>1</sup> But it seems to be the *Yūpa*—the sacrificial post, and the projecting lines on the two sides were meant for fastening the animals to be offered. The so-called 'Nāga Symbol'<sup>2</sup> of Prof. Rapson is found in the Kulūta, Kuṇinda and Yaudheya coins. The 'two S's with a straight line between' is the usual representation of this symbol : the curved lines are taken to be two hooded snakes but there is no explanation offered for the straight line in the middle. The identification therefore offers insuperable difficulties. In the Kuṇinda coin, this sign is found within the horns of the 'Stag' and on the rev. of the 3rd section of the Yaudheyas and was perhaps used by them

<sup>1</sup> *Ibid.*, Vol. IV, p. 326 (Cross).

<sup>2</sup> Rapson, E. J.—Catalogue of Coins of the Andhra Dynasty, etc., p. CLXXVI.

as a mint-mark . This Symbol of 'three points and three

dots' (?) is found only on the rev. of the coins of the 2nd section of the Yaudheyas. While the second section has a 'vase with flowers' and this symbol, the Third Section has the conch-shell and the Nāga Symbol on the rev. : perhaps the Nāga Symbol and 'the three points and three dots' Symbol were both of them the mint-marks of the two sections of the Yaudheya Tribe.

### THE TYPES.

The principal types in the tribal coins are the animals, birds, trees, weapons, human figures, the sun, the wheel, the vase, the king's head (?), the figures of deities and patron saints, and the personification of warlike prowess. These types are generally found in the punch-marked coins and are evidently of an early age e.g. the Humped Bull Figures in coins Nos. 9 and 10 (Smith's catalogue, pp. 136-142). Elephant in Nos. 9, 12, 16 etc., Tree in Nos. 18 and 19, the Sun in Nos. 18 and 19 and so on. The animals used as types in the tribal coins are the Humped Bull, the Elephant, the Lion, the Stag and the Camel (?). The Bull like the Elephant is a common emblem in Indian mythology and 'is associated with deities worshipped by various sects'.<sup>1</sup> The figure of the Bull is found either (a) with or (b) without hump, or (c) recumbent and is used as a type by the Audumbaras, Arjunāyanas, Mālavas, Vimakas, Uddehikas, Yaudheyas, Nāgas, Mahārāja and Rājanya Janapadas. The Arjunāyana Bull is a humped one and so is that of the Audumbaras, Vimakas, Uddehikas, Yaudheyas, Rājanya and Mahārāja Janapadas, while the Nāga Bull is recumbent. The Mālavas had all the three types—with or without hump and the recumbent. The Bull is thus the commonest of all the devices and this must be due to the special importance and sanctity attached to this animal. In the Vedic Age, the cow was the medium of exchange, it helped the Aryans in various ways, in the supply of their food and in the cultivation of their land. It was an animal sacred to Siva and other deities. Naturally it was adopted as a badge by various tribes and figured in the coins as a symbol or a type from a very early time in this country. The elephant, either its whole body or only the forepart, figured as a type among the Arjunāyanas, Audumbaras, Mālavas, Vimakas, Vṛishnis, Uddehikas, and the Yaudheyas. In the Arjunāyana coin the Elephant faces front with head right, trunk raised : only the head appears and this had great resemblance to the obv. type of the Indo-Parthian king Maues. Among the Vṛishnis, the type is composed of Half-Elephant and Half-Lion—a peculiar

<sup>1</sup> *Cambridge History of India*, Vol. I, p. 557.

emblem. In one variety of the Audumbaras, only the front half (viz. the head, trunk and the forelegs) appears as the type.

The Lion as the king of Beasts, naturally figured in the coins and stood for power and might. But it is clear that Lion was confined to only one part of the country, the desert region, and the Lion-type was prevalent only among the Mālavas and the Rājanyas. The Rājanya Lion stands facing a post and in the Mālava coin, the Lion stands left. The Lion however was not so popular as a type among the tribes as the Bull or Elephant. Another animal to serve as a type was the stag. The figure of the stag in the Kuṇḍa coins is very clear, and the same type occurs in the coins discovered at Almora which perhaps belong to a branch of the Kuṇḍas. The stag is very indistinct in the Yaudheya coins, and among the Mālavas the type has been identified as 'antelope standing'.

The camel as a type is very rare. It is perhaps found only among the Ārjunāyanas who dwelt in the border of the Indian desert i.e. Bharatpur and Alwār States in Rajputana.

The Vrishnis had a peculiar Type—a Half-Elephant and Half-Lion—the foreparts of the two animals are joined together and placed on a pillar which is surrounded by a railing. The representation in (unningham's book (pl. IV, fig. 15) is very distinct—the trunk of the elephant hangs down while the Lion is open-mouthed and ready to spring. It is a strange way of associating two animals—the Lion and the Elephant in one Type.

The Human Figure was also very popular as a Type. It is found among the Ārjunāyanas, Aśvakas, Audumbaras, Mālavas, Yaudheyas, the Māhārāja and Rājanya Janapadas. In the Aśvaka coins, the Human Figure is robed, with an upraised arm in an attitude of worship; and in the Audumbara coin, the man stands to front with spear in right hand. The Mālava figure is squatted to left, while the Ārjunāyana and Rājanya coins have a standing Human Figure with right hand raised as in the Northern Satrap coins. The Māhārāja Janapada had also a standing figure to front as a Type. The Yaudheyas, in their 'Warrior' Type coins had a Warrior standing, facing front and grasping spear in right hand with left hand on hip—'in the pose of a dignified *tribhāṅga*'.<sup>1</sup> According to Jayaswal, it represents the type of their citizen soldier and is surely a fit and proper device for a tribe which was noted for its military prowess. The Warrior, therefore, stands emblematical for the martial quality of the great fighters—the Yaudheyas.

The tree as a type or symbol is very common in the ancient coins of India. It is found in the punch-marked as well as die-struck coins. These are generally surrounded by railings and it is evident that they are not of the same species. In ancient

<sup>1</sup> J. HP. I., p. 150.



India and even at present, trees have sanctity attached to them and are specially sacred to certain deities, e.g. Tulasi is sacred to Vishnu and its leaves are offered to this god at the time of worship, and similar is the case with the Bel tree which is sacred to god Śiva. It is not however always possible to identify the trees—which are used as Types and Symbols on the coins. It is however sure that trees of various species were taken as emblems by the different peoples; and on occasions, these were looked upon as sacred. The Audumbaras had a Tree as a Type on the rev. of the Viśvāmitra Type coins. It is a Tree in Railing and is assuredly an Udumbara Tree. So the Udumbara Tree was the 'canting badge' of the Audumbara tribe i.e. the device had a punning allusion to the name of the issuing tribe. This practice was also common in the West—the quince (mêlon) at Melos, the pomegranate (sidê) in Side and so on.<sup>1</sup> The Mālavas and the Rājanya Janapada also used the Tree in Railing device in their coins, but the exact identity of these trees cannot be determined. The Tree in the Mālava coin No. 109 (Smith's catalogue, pl. XXI. 8) is perhaps a pine tree and that in the Rājanya coin (Smith, Pl. XXI. No. 12) may be a Vata tree. In some of the coins of the Mālavas (Smith, Pl. XX. Nos. 19 and 20) a pinnate palm leaf serves as a Type.

The only Bird that was used as a Type in the tribal coins was the fantail peacock. This device was adopted only by the Mālavas. The identification of 'King's-Head' Type on the rev. of some of the Mālava coins is very doubtful; it is most probably a 'fantail peacock' (pl. XX. No. 21—Smith's catalogue).

Weapons like Triśūla, Chakra, Bow and Arrow etc. are used as Types or Symbols. Triśūla is the Type of the Sibi coins. It was identified as a 'cross' by Cunningham but the portion visible seems to be the upper part of a Triśūla. It also occurs as a Symbol in the Viśvāmitra Type and Elephant: Temple Type coins of the Audumbaras. The Type on the rev. of the Vṛishṇi coin (Cunningham, Pl. IV, fig. 15) was taken to be a Dharmachakra by Cunningham, but the correct identification is a *Chakra* or discus. It was an attribute of sovereignty e.g. *Rājachakrabartī* signifies the king as the Wielder of the Discus. Moreover Krishna who is given divine honour by the Hindus belonged to the Vṛishṇi clan and had the discus as his special weapon. So Jayaswal's identification of the wheel-like object seems to be correct, and this is evident from 'the cutting edges and the projecting points on the rim'. The Wheel as a Type occurs in the coins of the Nāgas and the Kulūtas—the device in the Nāga coin has eight spokes, and in the Kulūta coin ten spokes within a circle of dots. It is not clear why this device was adopted by them, and its significance in the present state of our knowledge eludes our grasp. Another device was the vase

<sup>1</sup> Macdonald, G.—*Evolution of Coinage*, p. 76.

which figures as a Type in the Mālava coins and as a Symbol in the Kuṇḍa coins (Cunningham, pl. V, figs. 4 and 5—above the Stag). Smith identifies it with an Indian *lotā*. A vase filled with water is even now looked upon as an auspicious object and is used in ceremonial occasions. So this device is to be classed with Svastika, Nandipada etc. which are associated with a special auspicious occasion.

Lastly we come to another class of Types, viz. figures of gods, their temples and the patron saints. These have a religious significance, and evidently the coins were given these Types in honour of the national god or the patron saint. The Audumbaras put on some of their coins, the figure of Viśvāmitra the Rishi who was evidently their patron saint. The Rishi stands, facing, with right hand raised and left on hip. He wears matted locks, tied in a knot over the head, is scantily clothed perhaps in a piece of skin and has the sacred thread on the shoulder under the right hand (Cunningham, pl. IV, fig. 1). It is not possible to recognise what he has in his right hand but the pose is one of conferring blessings. The Yaudheyas as a military people adopted the figure of Brahmanyadeva or Kārttikeya, the War-god as a Type on one class of their coins. Kārttikeya is the commander-in-chief of the gods in Hindu pantheon and his representation on the coins of the Yaudheyas whose name is derived from *Yuddha* or war is perfectly natural and a fit badge for this tribe. Mr. Jayaswal is therefore correct in taking it to be the figure of a god, and on the face of it Smith's identification Brahmanyadeva as a Yaudheya king is untenable. The god is represented with six heads on some coins and with only one in others. But the representation is very rude, the six heads are arranged in two rows, one above the other; and the god holds spear on the right hand. One of the figures (Cunningham, pl. VI, fig. 12—obv.) has a small bird on its shoulder. Perhaps it is a peacock, the Vāhana or vehicle of this god. The rev. figure of the same coin is undoubtedly a female with six heads—Is it the wife of Kārttikeya or some other goddess? In the single-headed Type (Smith's catalogue—Nos. 18a and 18b, p. 182), the coins are specifically referred to as *Brahmanyadevasya drama* i.e. the coin dedicated to Brahmanyadeva whose other names are Kārttikeya, Śaḍānana and Kumāra—'the presiding deity of Heroism and War', or as put by Mr. Jayaswal 'the figure is their La Liberté'. The Kulūtas in their Chatreśvara Type had the figure of their national god on their coins—Śiva standing facing with trident battle-axe in right hand and leopard skin hanging from left arm. The vehicle of Śiva is the bull Nandi and it figures in the coins of the Kushanas (cf. Rapson—I.C., pl. II, No. 12). Śiva and his Bull were adopted as Types by other States also e.g. Pushkalāvati. Another Type which deserves our particular notice is the representation of a building on some of the Audumbara coins. It is a pointed-roofed building

of two or three stories with pillars. Jayaswal wants to identify it with 'their Motehall or some other public building'. The conical shape of the upper part of the building, the *Śikhara* and its disproportionate height tempt us to identify it with a temple in the Indo-Aryan style. It was perhaps the temple of their national god and as such must have been deemed a sacred place of worship. Here the people perhaps repaired for their national festivals, worshipped their god and prayed to him in times of national calamity, or offered thanks on the occasions of military victories. It must have been intimately associated with their national life, before its representation found a place on their coins.

#### THE PROVENANCE AND DESCRIPTION OF COINS.

I. *Arjunāyanas*, The. As a people they do not appear in Pāṇini, Patañjali or the Mahābhārata.<sup>1</sup> A reference is found for the first time in the Gaṇapāṭha on Pāṇini (IV, 1, 112),<sup>2</sup> and in the Allahabad Inscription of Samudragupta (c. 380 A.D.), they 'appear among the peoples on the frontiers of the Gupta Empire'.<sup>3</sup> The *Arjunāyanas* as a political community are supposed to have come into existence 'about the Śuṅga times (200 B.C.)',<sup>4</sup> and the name is derived from *Arjunāyana* the founder, 'one of the family of Arjuna'.<sup>5</sup> They issued coins as early as the first cent. B.C.<sup>6</sup> but these are 'extremely rare'.<sup>7</sup> They were then settled in Rājputanā, perhaps in the 'region lying west of Agra and Mathurā, equivalent, roughly speaking, to the Bhārathpur and Alwār states (J.R.A.S. 1897, p. 886)'.<sup>8</sup> These coins, all in copper, bear the legends—'Ārjunāyanāna', 'coin of the Ārjunāyanas' or '*Arjunayanana jaya*', 'Victory of the Arjunāyanas', in Brāhmī script.<sup>9</sup> The Ārjunāyana coins are closely related in style to the coins of the Northern Satraps, the Yaudheyas, the Audumbaras, the Rājanyas and others.<sup>10</sup> Cunningham hazards the suggestion that *Ajudhan* 'on the bank of the old Satlej river, may still preserve some trace of their name'.<sup>11</sup>

Type No. 1. The Standing Figure and the Humped Bull<sup>12</sup>  
Type (c. 100 B.C.). AE

*Obv.* : Humped Bull standing to l.

<sup>1</sup> J. HP. I., p. 154.

<sup>2</sup> *Ibid.*, footnote 1.

<sup>3</sup> CHI., I., p. 528.

<sup>4</sup> J. HP. I., p. 154; Prof. Rapson, however, places them in 4th cent. B.C. (CHI., I., p. 528).

<sup>5</sup> J. HP. I., p. 132.

<sup>6</sup> CHI., I., p. 528 (Rapson).

<sup>7</sup> S. CCIM., p. 160 (Vol. II).

<sup>8</sup> *Ibid.*

<sup>9</sup> J. HP. I., p. 154; S. CCIM., p. 166; C. CAL., p. 89, Pl. VIII, 20; R. IC., Sec. 42, Pl. III, 20; JRAS. (1900) p. 106 (Rapson).

<sup>10</sup> S. CCIM., p. 160; J. HP. I., p. 160.

<sup>11</sup> C. CAL., p. 90.

<sup>12</sup> R. IC., Pl. III, 20.

*Rev.*: Standing Figure with r. hand raised as in the Northern Satrap coins; the legend in Br. in the margin—*Ārjunāyanāna*, and a symbol on l. perhaps a flag or a spear.<sup>1</sup>

Type No. 2. The *Elephant and the Bull* Type.<sup>2</sup> AE Var. a. *Obv.*: A Tree in railing to r.; on the l. an Elephant facing f. with head r. and trunk raised. The head of the elephant has resemblance to that on the obv. of a coin of the Indo-Parthian king Maues.<sup>3</sup>

*Rev.*: A 'curved object' rising from a railing; and the Br. legend on the margin—'*Ārjunāyanana jaya*, (Ārjunāyananām jayah), 'Victory to the Ārjunāyanas'. The 'curved object' seems to have some resemblance to the flagstaff with 2 symbols dangling from it in a coin of Dhanadeva.<sup>4</sup> There is an indistinct figure in front of it<sup>5</sup> which had not been marked by Smith. Perhaps it is a Bull as in Type No. 1, though to r. The *rev.* side of this coin (Smith, Pl. XX, 10) has a great resemblance to the Yaudheya coin,<sup>6</sup> where a Bull standing r. faces a 'curved object' with a railing. Cunningham takes it to be a 'pillar with pendant garland', and on this analogy the indistinct figure on the Ārjunāvana coin may be a Bull.

Var. b. *Camel (?) and the Bull* Type. AE.

*Obv.*: A camel (?) to r. facing Tree within railing.

*Rev.*: Humped Bull to r. facing sacrificial post, within railing; Br. legend *Ārjunāyanāna jaya*, (Victory to the Ārjunāyanas). It has a striking resemblance to the Yaudheya coins. Its *rev.* type is the same as that of the Yaudheya coin in C. CAL., Pl. VI, 3; and 'it is struck in the same manner—slightly incuse'. —JRAS., 1900, p. 107.

II. *Aśvakas*, The.—The coins with the legend *Vaṭasvaka* were found in the neighbourhood of Taxila and Cunningham includes them among the Taxilian coins.<sup>7</sup> The inscription is in Brāhmī characters and the coins are of the single-die variety. Prof. Rapson is of opinion that the date of these coins 'is probably at least as early as 200 B.C.'<sup>8</sup> but they may be actually of an earlier date. Bühler explained the legend—*Vaṭasvaka*, 'as a tribal name, equivalent to Sanskrit *Vaṭāśvakāḥ*, meaning the *Aśvaka* tribe of the *Vaṭa* or fig-tree clan'.<sup>9</sup> The meaning however seems to be far-fetched. The *Aśvakas* have been correctly identified with the Assakēnoi mentioned by Arrian, and they dwelt in the Swāt valley. They 'were the first Indian people to receive the brunt of the invasion'<sup>10</sup> of Alexander the Great. The fighting was of exceptional ferocity and their

<sup>1</sup> Cf. the Yaudheya coin with soldier standing holding spear in right hand on the *rev.*; R. IC., Pl. III, 14; S. CCIM., Pl. XXI, 18, 19 and 20.

<sup>2</sup> S. CCIM., p. 166, Pl. XX, 10.

<sup>3</sup> C. CAL., p. 92., Pl. IX, 9 *rev.*

<sup>4</sup> *Ibid.*, p. 180, Pl. XXI, 13 *obv.*

<sup>5</sup> R. IC., p. 14.

<sup>6</sup> CHI., p. 352.

<sup>7</sup> *Ibid.*, p. 40, Pl. VIII, 4.

<sup>8</sup> S. CCIM., Pl. XX, 10 *obv.*

<sup>9</sup> C. CAL., Pl. II.

<sup>10</sup> S. CCIM., p. 147.

chief town Massaga fell into the hands of the invader after a stout resistance. We have, however, no reference either in the writings of the Greeks or in Sanskrit literature of the *Vaṭa* (fig-tree) clan of the *Aśvakas*. The word *Vaṭa* also means a cowry shell, and we know that cowries were, and even at present are, used as mediums of exchange. So it might mean a 'coin' and this will give a better meaning to the legend *Vaṭasvaka*.—(*Aśvakānām Vaṭah* = *Vatāśvakaḥ*, acc. to Pāṇini—II. 2. 31), 'the coin of the *Aśvakas*'. These coins as pointed out by Prof. Rapson are 'connected by identity of type with some of the single-die coins found in the neighbourhood of Taxila'.<sup>1</sup> (Cf. C. CAL., Pl. II, figs. 9, 11 and 14). The symbols are the same but there is no legend; obviously these coins belong to the same tribe, and are of an earlier date. Two of these symbols are very prominent in coins Nos. 9 and 11; and I am disposed to classify them as varieties of the *Aśvaka* coins. A tentative classification of the coins of the *Aśvaka* tribe may be effected by dividing them into two Types of two varieties each.

Type No. 1. Var. a.<sup>2</sup> AE.

There are two symbols: (a) the so-called pile of 'bales'<sup>3</sup> or 'balls'<sup>4</sup> and above, (b) the so-called *Chaitya*, (both are perhaps the different varieties of the Hill Symbol); to r. a robed human figure with an upraised arm in an attitude of worship with a *nandipada* below: to l. the Br. legend—*Vaṭasvaka* in characters of 3rd cent. B.C. Var. b.<sup>5</sup> These coins have only the two common Hill Symbols and the figure of the man is standing between with an upraised hand; there is no legend, nor the *nandipada*.

Type No. 2. Var. a.<sup>6</sup> AE.

The two prominent Hill Symbols, a *Śvastika* above, and a zigzag line (river?) below. Var. b.<sup>7</sup> This variety has the three symbols (the two Hill Symbols and the river Symbol) common with Var. a. but two peculiar symbols are introduced below them. V. Smith only notes that these symbols are 'made of curved lines'<sup>8</sup> and Prof. Rapson takes them to be 'wavy lines and uncertain designs' and suggests 'vine branches (?)'.<sup>9</sup>

III. *Audumbaras*, The.—The name *Audumbara*, the *Odomboeræ* of Ptolemy<sup>10</sup> is derived from the *Udumbara* fig-tree (*Ficus glomerata*).<sup>11</sup> They are unknown to the early Pāṇinian literature but are mentioned in the *Rājanya* group in the *Gaṇapāṭha*; and are also referred to in connection with the

<sup>1</sup> R. IC., p. 14.

<sup>3</sup> *Ibid.*, p. 61.

<sup>5</sup> C. CAL., Pl. II, fig. 14.

<sup>7</sup> *Ibid.*, fig. 9.

<sup>9</sup> R. IC., Pl. I., 11; C. ASR., XIV, Pl. X, (No. 10).

<sup>10</sup> D. GDAMI., p. 13.

<sup>2</sup> C. CAL., Pl. II, fig. 17.

<sup>4</sup> S. CCIM., p. 156, footnote 1.

<sup>6</sup> *Ibid.*, fig. 11.

<sup>8</sup> S. CCIM., p. 156 (No. 4).

<sup>11</sup> C. CAL., p. 66.

Punjab republics in the *Sabbhā-Parvan* of the *Mahā-Bhārata*.<sup>1</sup> Varāha Mihira places them in the company of the *Kapisthalas*, 'while the *Vishṇu Purāṇa* couples them with the *Traigarttas* and the *Kulindas*'.<sup>2</sup> In the *Bṛihat Samhitā*, *Udumbara* is the name of 'the district of Nurpur (or rather Gurudaspur)'.<sup>3</sup> The *Audumbara* coins are 'extremely rare' and are found in the *Kaṅgrā* and *Hoshyārpur* Districts of the Punjab.<sup>4</sup> Perhaps they dwelt in the country between *Kāṅgrā* and *Ambāla*<sup>5</sup>; and as *Pliny* locates them in *Cutch*, so it is evident that one branch of the people must have migrated to that region and their descendants are found there and form 'the modern community of *Gujrati Brahmins* of the *Audumbara* caste'.<sup>6</sup>

The *Audumbara* coins resemble those of the *Ārjunāyanas* and 'other classes of ancient coins',<sup>7</sup> and were struck 'in the name of the community and the king'.<sup>8</sup> These coins probably date from the first century B.C. and have legends in *Kh.* and *Br.* *Jayaswal* is of opinion that 'the *Kharoshthī* script indicates that about 100 B.C. they came under the influence of the *Satrapas* like their neighbours of the Punjab, and were finally absorbed'.<sup>9</sup> There is a great similarity in style between the *Audumbara* coins and 'the *hemidrachms* of Greek prince *Apollodotus* and are found together with them'.<sup>10</sup> Prof. *Rapson* also points out that 'a similarity in style is observable' between 'Viśvāmitra Type' and one of *Azilises*.<sup>11</sup>

Type No. 1. The *Viśvāmitra* Type.<sup>12</sup> AR.

*Obv.*: The standing figure of *Viśvāmitra*, the *Rishi* with r. hand raised and the l. resting on the waist; the *Kh.* legend—*Mahadevasa raṇo Dharaghoshusa Oduṃbarisa*—across field,—*Viśpamitra*, 'Of His Exalted Majesty'<sup>13</sup> *Dharaghosha* of the *Audumbaras*, or of *Dharaghosha*, the worshipper of *Mahādeva*, i.e. *Māhādeva*, of the *Audumbaras*. *Jayaswal* takes 'Mahādeva' (or *Māhādeva* ?) to mean 'His Exalted Majesty' but it appears that the word refers to their national god. *Viśvāmitra* was their patron saint.

*Rev.*: The same legend in *Br.*: the *Udumbara* (fig tree) on the r. within a railing, and the trident battle-axe on l. The tree was the *lakṣhaṇa* and the trident, 'the figure of their standard'.<sup>14</sup>

Type No. 2. The *Elephant and the Temple* Type. AE.

<sup>1</sup> J. HP. I., p. 160.

<sup>2</sup> D. GDAMI., p. 13.

<sup>3</sup> J. HP. I., p. 160.

<sup>4</sup> S. CCIM., p. 161.

<sup>5</sup> *Ibid.*

<sup>6</sup> *Ibid.*

<sup>7</sup> C. CAI., p. 67, Pl. IV, fig. 1; for other specimens see R. IC., Pl. III, 8; and CHI., p. 539, Pl. V, 14.

<sup>8</sup> J. HP. I., p. 161.

<sup>9</sup> *Ibid.*, and pp. 42 and 43—*Lakṣhaṇa* is the 'lāṇchhana' or heraldic crest. It is usually 'the figure of an animal or river, town or the like.'

<sup>10</sup> C. CAI., p. 66.

<sup>11</sup> S. CCIM., p. 160.

<sup>12</sup> *Ibid.*, p. 161.

<sup>13</sup> J. HP. I., p. 161.

<sup>14</sup> R. IC., p. 11.

Var. a.<sup>1</sup> *Obr.*: Elephant walking before the Udumbara tree surrounded by a railing and a zigzag line (snake or river ?) beneath ; the Kh. legend incomplete—*Odumbara...*, placed under the wavy line.

*Rev.*: A pointed-roofed building of two or three stories, with pillars ; a pillar with *Svastika* on it to l., and a shaft surmounted by a wheel (the so-called *Dharma-chakra* of Cunningham) with 'pendant garlands'. The building may be the temple, 'their mote-hall (?) or some other public building',<sup>2</sup> and the 'shaft with the wheel' the figure of their standard.

Var. b.<sup>3</sup> *Obr.*: There are two points of difference with the first variety—the position of the Kh. legend and the figure of the Elephant. In this variety, the legend is found on the r. of the Elephant and not under the zigzag line ; and while in Var. a., the whole body of the Elephant is found, in this Var. b., the head, trunk and the forelegs are only seen. It is evident that the entire body must have been absent in the die, as the Kh. legend *Odumbarisa* is 'found to the right of the Elephant's forepart'.

*Rev.*: The temple is a three-storied one and slightly different from the first variety. There is a trident (*triśūla*) with banners to r. and the Br. legend on top. These coins have legends both in Br. and Kh. and the complete legends as restored by Mr. Rakhal Das Banerjee are—<sup>4</sup>

*Obr.*: Kh.—Mahadevasa Raña Dharaghosasa Odumbarisa.

*Rev.*: Br.—Mahadevasa Raña Dharaghosasa Odumbarisa.

In the coins of two other kings *Rudradāsa* and *Śivadāsa*, their names spelt as Rudradasa and Śivadasa are introduced without any other change in the legends. The Br. and Kh. letters 'belong to the first century B.C. and one peculiarity is that the long vowels ā, ū, ai and au are avoided both in Br. and Kh'.

Type No. 3.—The *Elephant and the Bull Type*.<sup>5</sup> AR.

*Obr.*: Elephant with upraised trunk moving to l.<sup>6</sup> towards trident battle-axe ; Br. legend.

*Rev.*: Humped Bull to r., flower (lotus flower ?) under head ; Kh. legend. The legends are—<sup>7</sup>

*Obr.*: Br.—bh (a) gavatomahādevasarājārājasa.

*Rev.*: Kh.—bhuguvusamahadevasarajaraña.

The legend on these coins had been interpreted to refer to a king named Mahādeva. But this cannot be taken to be certain.

<sup>1</sup> C. CAI., p. 68, Pl. IV, fig. 2.

<sup>2</sup> J. HP. I., p. 161.

<sup>3</sup> J.A.S.B. 1914 ; (Numis. Sup., No. XXIII, 247-250).

<sup>4</sup> *Ibid.*, p. 249.

<sup>5</sup> C. CAI., p. 68, Pl. IV., figs. 5 and 6.

<sup>6</sup> *Ibid.*, Pl. IV, fig. 5.

<sup>7</sup> J.R.A.S., 1900 (A. V. Bergny), p. 411.

The word *bhagavata* is generally applicable to gods,<sup>1</sup> and the title 'rājarāja', 'the king of kings' is more applicable to a god than to the king of a small principality. Moreover 'Mahadevasa' in the coins of Dharaghosha might refer to the national god, of whom Dharaghosha was the worshipper. So I would rather take this legend as applicable to god Mahādeva and the coin seems to be dedicated to him like the Chatreśvara Type<sup>2</sup> of Kuṇinda coins. The legend therefore may be interpreted as follows—'In the name of the Almighty Mahādeva, the king of kings'.

Type No. 4. *Elephant and Man Type*. AE.

Var. a.<sup>3</sup> *Obv.*: Elephant with upraised trunk moving to l., with<sup>4</sup> or without<sup>5</sup> a man on its back; the legend either in Br. or Kh.

*Rev.*: Man standing to f. with spear in r. hand with or without zig-zag line and the legend in Kh.

(a) (C. CAL., Pl. IV, 7).

Br.-...ñoajamitasa.

Kh.-raña (or ño) ajamitrassa—'of king Ajamitra'.

(b) (C. CAL., Pl. IV, 9).

Bh.: r (.) mahim (.) ta...

Kh.:...ñamahimitrassa—'of king Mahimitra'.<sup>6</sup>

Jayaswal interprets the word Rājna or 'Rājanya'—(Cunningham) as meaning a president, the executive head, or an elected ruler of a tribe.<sup>7</sup>

Var. b.<sup>8</sup> *Obv.*: Male Figure to f., with spear in r. hand; the zig-zag line (snake or river?) to r.

*Rev.*: Figure on Elephant to l.; Kh. legend—*Maharajasa Dhara* (?),—the reading is very uncertain.

Type No. 5. *The Elephant and Three Symbols*.<sup>9</sup> AE.

*Obv.*: Elephant to l.; Kh. legend.

*Rev.*: The Three symbols—one is a *Tree*, the other—*Nandipada* but the third cannot be recognised; the snake (zig-zag line) referred to by Cunningham seems to be a part of the *Nandipada* Symbol; the legend in Br.—the same legend is found on both the sides—

*Rev.*: Br.—(ra) ñobhānumitra(sa).

*Obv.*: Kh.-rañabhāna (or nu) mitrassa, 'of King Bhānumitra'.

<sup>1</sup> (a) Kuṇinda coins—Chatreśvara Type—*Bhāgavata Chatreśvara Mahātmanah* (S. CCIM., p. 170).

(b) Yaudheya coins—Brahmanyadeva Type—*Bhāgavatah Scāmīno Brahmanyadevasya*. (S. CCIM., p. 181).

<sup>2</sup> R. IC., Pl. III, 10.

<sup>3</sup> C. CAL., p. 69, Pl. IV, figs. 7-9.

<sup>4</sup> *Ibid.*, Pl. IV, fig. 9.

<sup>5</sup> *Ibid.*, Pl. IV, figs. 7 and 8.

<sup>6</sup> JRAS., 1900, p. 414 (A. V. Bergny).

<sup>7</sup> 29 J. HP. I., pp. 42 and 160.

<sup>8</sup> C. CAL., p. 69, Pl. IV, fig. 10.

<sup>9</sup> *Ibid.*, fig. 12.



Type No. 6.—*The Sun and the Three Symbols*.<sup>1</sup> AE.

*Obv.* : The Three Symbols as on the rev. of Type No. 5 ;  
Br. legend—*Bhānumitrāsa*, 'Of Bhānumitra'.

*Rev.* : The rayed disc of the sun above a railing ; the figure of the sun refers to the name of the king Bhānu (the sun). This coin is assuredly a Pañchāla coin and perhaps the Type No. 5 also should be assigned to that locality.

Cunningham included the coins of Rudravarman, Ajamitra, Mahimitra, Bhānumitra, Virayaśas and Vṛishṇi among those of the Audumbaras. But Mr. R. D. Banerjee does not accept this view on the ground that we have not the name 'Odumbara' coupled with these names, while in the case of Dharaghosha, Śivadāsa and Rudradāsa 'we invariably find that the name of the tribe is associated in the legend with that of the king. Consequently the attribution of coins which do not bear the name of the tribe to the Audumbaras, must be very doubtful'.<sup>2</sup> But there is no reason that the same practice should be adhered to throughout the ages ; a change in the constitution of the Audumbaras might lead to the introduction of a new form of legends. So long as great importance was attached to the tribal character of the constitution, the name of the tribe was coupled in the coins with the names of their rulers ; but if later on with a change in the constitution and the augmentation of their authority, the rulers gave only their own names and omitted that of the tribe, there is nothing improbable in it. We cannot, therefore, accept Mr. Banerjee's statement in full. Some of the coins e.g., those of the Vṛishṇis, Mahārāja Janapada, Virayaśas, and perhaps of Bhānumitra had been wrongly attributed by Cunningham to the Audumbaras. But the resemblance in style leads me to attribute the coins of Mahimitra and Ajamitra to the Audumbaras ; and it is almost certain that they were the rulers of this tribe, of which the national god was Mahādeva or Siva. It is also probable that the coins without the tribal name were of a later date than those of Dharaghosha, Rudradāsa and Śivadāsa who preceded them.

IV. *Kulūtas*, The.—They were 'the eastern neighbours of the Udumbaras' and lived in 'the Kulū valley of the Kāngrā district'.<sup>3</sup> Their coins have been assigned by Prof. Rapson to the first or second century A.D. They usually used both Br. and Kh. in the coin legends, as they like the Udumbaras and the Kunindas 'lived on the border between the regions in which the two ancient alphabets Brāhmī and Kharoshthī prevailed'.<sup>4</sup>

They are mentioned in the *Mahā-Bhārata*, the *Bṛihat Samhitā* and other Sanskrit works, as well as in the inscriptions.<sup>5</sup>

<sup>1</sup> *Ibid.*, fig. 13.

<sup>2</sup> JASB., Vol. X. No. 6, 1914. (Numis. Supp., No. XXIII, p. 248).

<sup>3</sup> Prof. Rapson in CHL., I., p. 529.

<sup>4</sup> *Ibid.*

<sup>5</sup> JRAS., 1900—Rapson, *Notes on Indian Coins and Seals* III—The Kulūtas, a people of Northern India.

Their country was visited by Hiouen Tshang and they are sometimes referred to as *Mlecchas* in the Sanskrit literature, and this perhaps means that they were foreigners. But it is evident from their coins that they had by this time adopted Indian names. The *obv.* type has great resemblance with Vṛishni coins. (C. CAI., Pl. IV, fig. 15).

*Type*—The Wheel Type. AE.

*Obv.*: The Wheel surrounded by a circle of dots; Br. legend—*Rājña Kolūṭasya Virayaśasya*’, (coin) of King Virayaśa, the Kolūṭa.<sup>1</sup>

*Rev.*: The Hill symbol (the so-called *Chaitya*) with the *Nandipada* above, *Svastika* on l. and another symbol ‘Two S’s with a line between’ on the r.—the Kh. legend gives only the word *Raṇa*. The Br. letters are of the 1st or 2nd century A.D. and this conclusion is strengthened by the curtailment of the Kh. legend. As pointed out by Prof. Rapson in the bilateral coin legends ‘the importance of the Kh. alphabet tends to diminish as time goes on’. In the earliest known coins of this class which are placed in the first century B.C., (in the silver coins of the Kuṇindas and the Audumbaras) the Kh. inscription is full. But in the Kulūṭa coin only the title *Raṇa* in Kh. is found on the *rev.* This clearly shows that Kh. had lost its importance and was being superseded by Br.

V. *Kuṇindas*, The.—They are the *Kulindrine* of Ptolemy and it is also spelt as *Kauliṇḍas* or *Kauṇindas*. The spelling in the coins is *Kuṇinda* as also in the *Bṛihat Samhitā* of Varāha Mihira. *Kuliṇḍa* in the *Vishṇu Purāṇa* and *Kauliṇḍa* in the *Mārkaṇḍeya Purāṇa*.<sup>2</sup> These coins are found in large numbers ‘in the country between Ambāla and Shahāranpur’.<sup>3</sup> and ‘three of the silver coins were found at Jwālamukhi in Kāngrā associated with the coins of Apollodotos (circ. 150 B.C.)’.<sup>4</sup> (Cunningham identified the Kuṇindas with the *Kunets* or *Kanets* of the Simla Hills.<sup>5</sup> But Jayaswal rejects this identification and is supported by Sir G. Grierson.<sup>6</sup> They however ‘inhabited the country of the Sutlej in the Simla Hill States’.<sup>7</sup> The Udumbaras, the Kulūṭas and the Kuṇindas ‘lived on the border between the regions in which the two ancient alphabets, Brāhmī and Kharoshthī prevailed: they accordingly used both of them in their coin legends’.<sup>8</sup> In most of the coins of the Kuṇindas, both silver and copper, occur the word *Amoghabhūti*, but these coins ‘vary much in execution, and probably extend

<sup>1</sup> C. CAI., p. 70, Pl. IV, fig. 14. Cunningham read ‘*Koputasya*’ or ‘*Koptanasya*’; Rapson suggested ‘*Kopūta*’, ‘the very pure’. But it was Mr. Bergny who first correctly read ‘*Kolūṭasya*’. JRAS., (1900), p. 415.

<sup>2</sup> C. CAI., p. 71; J. HP. I, p. 82, footnote 1.

<sup>3</sup> S. CCIM., p. 161.

<sup>4</sup> J. HP. I., p. 82, footnote 1 and 217.

<sup>5</sup> CHI, I, p. 529.

<sup>6</sup> C. CAI., p. 71.

<sup>7</sup> C. CAI., p. 71.

<sup>8</sup> *Ibid.*

over a considerable period'.<sup>1</sup> V. Smith takes the word *Amoghabūti* to be the name of a king, and was, therefore, forced to the conclusion that the name of *Amoghabhūti* was continued even long after his death. Jayaswal, however, has pointed a way out of this difficulty. In this opinion, the Kuninda coins refer both to the name of the king and the political community. 'Their king, is always mentioned there as *Amoghabhūti*. 'of unfailing prosperity', and the same appellation appears for centuries (150 B.C. to 100 A.C.). This was an official title and not a personal name'.<sup>2</sup> But we have no corroboration of this statement from other sources which would obviate all our doubts. The legends in the coins are in an old form of Brāhmī and in some of the coins, these are also repeated in Kharoshthī. The coins with both Br. and Kh. legends are supposed to be of an earlier date by Smith.<sup>3</sup> The later issues were surely influenced by the copper coins of the Kushana period. But their attribution to the 3rd and 4th century A.D. by Prof. Rapson seems to be too late,<sup>4</sup> though there is practically no doubt that the Hindu states like the Yaudheyas, the Kuṇindas etc. 'rose in power as the Greek and Kushana supremacies successively declined'.<sup>5</sup> The *Chatreśvara* Type is surely 'later in date than the 'Stag Type' coins with the name of Amoghabūti'.<sup>6</sup> So the period covered is 150 B.C.<sup>7</sup> to 200 A.D.<sup>8</sup>

Type No. 1. *The Stag Type* (2nd century B.C.).<sup>9</sup> AR.

*Obv.* : Female with l. hand on hip with lotus flower in r. hand : a stag standing to r. and two symbols, one between the horns of the stag and the other above it, and this is supposed to be a square stūpa surmounted by an umbrella : a mint mark.—a disc surrounded by dots at hindfoot of stag : the marginal Br. legend—*Amaghabhūtiśa maharājasa rājña Kuṇḍasa*. (*Amoghabhūtiśa mahārājasa rājña Kuṇi* (n) *dasa*)—'coin of Amoghabūti Mahārāja, Rājā, the Kuṇinda or of the Kuṇindas'.<sup>10</sup> (or of Mahārāja of unfailing strength, the king of the Kuṇindas).<sup>11</sup> We also find different symbols in other coins e.g. *svastika*, *nandipada* or two short curved lines ; and rājña is sometimes spelt as rāña. The so-called *Chaitya* of three arches (the *Hill* symbol) also occasionally occurs.

*Rev.* : A high so-called six-arched chaitya (the *Hill* Symbol ?) with umbrella (!) in centre ; to r. conventional tree in railing, to l. *svastika* and a triangular-headed symbol—(yūpa ?) and above a *nandipada* ; below a curved line (snake or river ?) which appears to have been put merely for ornamental

<sup>1</sup> S. CCIM., p. 161.

<sup>2</sup> S. CCIM., p. 161.

<sup>3</sup> *Ibid.*

<sup>4</sup> 150 B.C.—S. CCIM., p. 161 ; 100 B.C. —R. IC., p. 12.

<sup>5</sup> 100 A.D.—S. CCIM., p. 167 ; 3rd or 4th cent. A.D. —R. IC., p. 12.

<sup>6</sup> S. CCIM., p. 167.

<sup>7</sup> *Ibid.*

<sup>8</sup> J. HP. I., p. 82, footnote 1.

<sup>9</sup> J. HP. I., p. 82, footnote 1.

<sup>10</sup> R. IC., p. 12.

<sup>11</sup> S. CCIM., p. 161.

purposes ; Kh. legend in the margin—*Raṇa Kuṇidasa Amoghābhatīsa* ; below *maharajasa*.<sup>1</sup>

AE. or Brass—A. With both Br. and Kh. legends.<sup>2</sup>

*Obv.* : Device and legend in Br. as in silver coins but without mint-mark ; legend generally imperfect.

*Rev.* : Device as in silver coins ; legend in Kh.

B. With Brāhmī Legend only.<sup>3</sup>

*Obv.* : Device and legend in Br. as above.

*Rev.* : Device as above but no legend.

C. With no legend.

*Obv.* and *Rev.* Device as above.<sup>4</sup>

Type No. 2.—The *Chatreśvara* Type.<sup>5</sup> AE. (Later than Amoghābūti).

*Obv.* : Śiva facing with trident battle-axe in r. hand, and leopard skin hanging from l. arm ; Br. legend—*Bhāgavata Chatreśvara Mahātmanah*.<sup>6</sup> 'Of the Almighty Mahādeva, the lord, i.e. the coin dedicated to god Maheśvara'. Prof. Rapson identifies the skin on the l. arm with that of an antelope but as leopard skin is associated with god Śiva, so Cunningham's suggestion is more acceptable.

*Rev.* : Stag standing l. in the middle ; conventional Tree in railing and a vase with flowers or leaves above on the r. ; on the l. the 'triangular-headed' symbol, the *Hill* symbol (the so-called six-arched chaitya) with a *nandipada* above and a zigzag line (not a snake) for ornamental purpose l. ; and a symbol within the horns of the stag.

*Almora (or Kedārabhūmi)*.—Three specimens of coins were found near Almora and these are 'different in fabric from every other known Indian coinage'.<sup>7</sup> The metal used was 'some alloy of silver' and the coins 'are heavier than any other Indian coins'.<sup>8</sup> Two of these coins bear the names of Śivadatta and Śivapāli(ta) in Br. letters which are taken to be by Prof. Rapson 'of a date between the 1st century B.C. and the 2nd century A.D.'. The *obv.* type has some similarity with that of a few coins of the Pañchālas, and the 'Stag' on the *rev.* has great resemblance to the 'Stag Type' coins of the Kuṇindas. Prof. Rapson attributes these coins to a branch of the Kuṇindas 'whose territories extended further east along the southern slopes of the Himalayas as far as Nepal'.<sup>9</sup>

Type—Legend Śivadatta.<sup>10</sup> AR.

<sup>1</sup> S. CCIM., p. 167 (coin No. 1).

<sup>2</sup> *Ibid.*, p. 168.

<sup>3</sup> *Ibid.*

<sup>4</sup> *Ibid.*, 169.

<sup>5</sup> *Ibid.*, p. 170 ; R. IC., Pl. III, 10.

<sup>6</sup> V. Smith writes *mahāmanah* which is clearly a misprint for *Mahātmanah* (ātma) in the sense of God. *Mahātmanah* means 'of Maheśvara' and *Chatreśvara*—the lord. (R. IC., Pl. III, 10).

<sup>7</sup> R. IC., p. 10.

<sup>8</sup> *Ibid.*

<sup>9</sup> CHI., 529 (Prof. Rapson).

<sup>10</sup> *Ibid.*, p. 539.

*Obv.* : Two symbols between the posts : the upper one is the triangular symbol, and the lower one may be a *nandipala*(?).

*Rev.* : The legend—*Sivadatasa* ; in the margin a *stag* and a *tree* within railing : in the centre, an uncertain type, may be a symbol or a letter.<sup>1</sup>

VI. *Mahārāja Janapada*.—Mahārāja is the name of a state and is referred to by Pāṇini in a rule which contemplates a man owing loyalty to it.<sup>2</sup> Jayaswal is of opinion that during the Śuṅga period, they had a republican constitution, whatever might have been the system in vogue at the time of Pāṇini. These coins have been found in the Punjab, but the exact locality where this Janapada dwelt cannot be determined. The legends are either in Br. or Kh., and this leads Jayaswal to infer that the original Br. legend was changed into Kh., when they passed under the influence of the foreign rulers.<sup>3</sup> But on the analogy of the Kulūta coin and the Stag Type copper coins of the Kuṇḍas, the Br. legend might have succeeded the Kh., the coins, on this basis, may be dated in the 2nd cent. A.D.

*Humped Bull and the Standing Figure Type*. AE.

Var. a. *Obv.* : A Humped Bull to l., a crescent over the head and a symbol (*Vajra* !) over the back.

*Rev.* : A Standing Male Figure to f. and a Kh. legend around the coin—*Mahārāja Janapadasa*. 'Of the Mahārāja Janapada'.<sup>4</sup> In Var. b. occurs the same legend in Br. : 'the Bull with the crescent' may surely raise a strong presumption that they were Śaiva or the worshippers of Śiva.<sup>5</sup>

VII. *Mālavās*, The.—Alexander, the Great, while marching down the Indus came upon the *Kshudrakas* and the *Mālavās* or as they were spelt by the Greeks the *Oxydrakai* and the *Malloi* respectively.<sup>6</sup> They had extensive territories and large population. These states had several cities, were very rich and noted for military prowess and had republican constitution, perhaps formed into one League<sup>7</sup> as suggested by Mr. Jayaswal. Cunningham places the Mālavās near Multan which he identifies with their capital,<sup>8</sup> or as Jayaswal puts it 'their cities were along the Chenab and their capital was near the Ravi'.<sup>9</sup> Kautīlyā however does not mention the Kshudrakas and the Mālavās in his list of martial republics, and it has therefore been inferred that they had already come under the Imperial Rule of the Mauryas.<sup>10</sup> The two tribes reappear in the Śuṅga times but later on the Kshudrakas vanish altogether, perhaps they became

<sup>1</sup> *Ibid.*, Pl. V., fig. 17, p. 539.

<sup>3</sup> *Ibid.*

<sup>5</sup> J. HP. I., p. 159.

<sup>7</sup> 'The Mālavās of the Punjab and the Kshudrakas are associated in Sanskrit literature'.—CHL., I, p. 375, footnote 1.

<sup>8</sup> C. AGI., p. 272.

<sup>10</sup> *Ibid.*, p. 149.

<sup>2</sup> J. HP. I., p. 159.

<sup>4</sup> C. CAL., p. 69, Pl. IV, fig. 11.

<sup>6</sup> J. HP. I., p. 68.

<sup>9</sup> J. HP. I., p. 68.

amalgamated with the Mālavas.<sup>1</sup> In the 2nd century B.C., they are found in their new homes at Karkota Nāgar 'within the territory of Rājā of Uniyāra, a feudatory of Jaypur', 'a distance of twenty-five miles a little east of south from Tonk in Rajputana.'<sup>2</sup> They migrated *via* Bhātinda in Patiala state 'where they have left traces of their name (in Mālwaī dialect extending from Ferozpora to Bhātinda)'<sup>3</sup>; and are found fighting with the Uttamabhadras to the west of Ajmer before 58 B.C. They later on occupied the vast territory to the south of Nāgar 'which permanently bears their name'.<sup>4</sup> There is no doubt that one section of the people remained in North Punjab; and the two Mālava peoples of Prof. Rapson are surely the two branches of the same tribe.<sup>5</sup> We find them mentioned among the opponents of Samudragupta along with the Yaudheyas, the Madras, the Ārjunāyanas and others. Their subsequent history is lost and they vanish altogether in the later Gupta period. The Mālava coins are generally found in the country 'about Ajmer, Tonk and Chitor'.

V. Smith rightly points out that 'in the vast range of Indian coinages their coins are among the most curious and enigmatical'.<sup>6</sup> The chronology of the series has not yet been precisely determined. Carlleyle and Cunningham assign them to 250 B.C. to 250 A.D.; Smith and Prof. Rapson are agreed that the initial date is about 150 B.C. but Prof. Rapson pushes them to the 5th century A.D.; Smith however attributes the cessation of this local coinage from Nāgar to 'the extension of the power of Chandragupta II about 380 A.D.'<sup>7</sup>—and he seems right in his estimate. These two great scholars also differ as regards the dates of the various types. Mr. R. O. Douglas<sup>8</sup> made some suggestions which are very helpful in laying down a few broad principles for classifying the Mālava coins according to chronology. The legends that occur in these coins are—(A) the various forms of the tribal name, (B) and a number of peculiar names of their princes. In class A, we have the following<sup>9</sup>: (a) *Mala*, (b) *Malaya* or *Mālaya*, (c) *Malava* or *Mālava*, (d) *Mālava Jaya*, 'the Mālava Victory', (e) *Mālavanū jaya* and its variants *Malavaṇa Jaya*, *Mālavaṇa Jaya* or

<sup>1</sup> *Ibid.*, p. 152.

<sup>3</sup> J. HP. I, p. 152.

<sup>5</sup> '..... is it not just possible that there may really have been two peoples: (i) the Mālava of the north represented the Malloi of the Greek writers, by the coins having the inscription Mālavanām Jaya (h), by the Malaya of the Mudrārākṣasa, and by the Mo-lo-so (Mo-lo-po) of Hiouen Tshang; and (ii) the better known Mālava of the south called Mo-lo-po by Hiouen Tshang'—JRAS, (1900), p. 542 (Prof. Rapson).

<sup>6</sup> S. CCIM., p. 161.

<sup>7</sup> *Ibid.*, p. 162; Numis. Supp., No. 37, p. 43 (ASB., Vol. XIX, No. 6 (New series)).

<sup>8</sup> Douglas, R. O.—On Some Mālava Coins (Numis. Supp., No. 37).

<sup>9</sup> S. CCIM.; Douglas—On Some Mālava Coins.

<sup>2</sup> S. CCIM., p. 162.

<sup>4</sup> *Ibid.*

*Malavahṇa Jaya* etc., 'Victory of the Mālavas', (f) *Mālavā nām*; (g) *Malava gaṇasya*, 'Of the Mālava gaṇa',<sup>1</sup> (h) *Malava Sujaya*, 'the well-conquering Mālava (Douglas)'. The last legend is read only in one coin; Mr. Douglas is however confident that it is not 'ṇa' but 'su'. We however must suspend judgment till the discovery of other similar coins.

Mr. Douglas has correctly shown that *Malaya* or *Mālaya* is the earlier form of *Mālava*<sup>2</sup>; the Greek form *Malloi* stands for *Malaya* and the correct transliteration for *Malava* would have been *Malluoi*.<sup>3</sup> The word '*Malu*' he takes to be the name of a king, the founder of the Mālava tribe. The form *Mālavanā Jaya* is surely of an earlier date than *Mālavānām Jaya*, which may be dated in the 2nd century A.D. Another very important datum can be gleaned from the fact that in some of the coins the legends read from right to left. This clearly shows the influence of the Kharoshthī alphabet and perhaps the Mālavas brought this practice from their early settlements in the 'valleys of the Ravi and the Beas'. These coins with very good reasons can be ascribed to an earlier age. The conclusions based on palæography have to be tested with reference to the form of the legends, the language employed and the way in which the letters are arranged. The adoption of these principles, which are reasonable enough, would necessitate a rearrangement of the different groups of coins in Smith's catalogue. But the most difficult problem is the chronology of the coins which are generally ascribed to the Mālava kings with peculiar names. The relationship of these coins with those that are unmistakably Mālavan is evinced by some of their legends as well as *provenance*. In Smith's catalogue (No. 70), we have a two-line legend, (a) *Malavā*, (b) *Majupa*, both read from right to left. Here *Majupa* is the name of a king and he must be connected with the Mālavas.

Jayaswal suggested<sup>4</sup> that the coins with the names of kings belong to the power which superseded the Mālavas. But we cannot accept this view. We find that both the series were contemporaneous from the 2nd century B.C. to 2nd century A.D. The coins with the tribal names in Prākṛit have to be assigned to the 2nd century B.C.; so is the case with the coins of Bhapaṃyana, Yama (Maya ?) and others who have to be placed in the same period on palæographical grounds.<sup>5</sup> Again the coins with their legends in classical Sanskrit.—'*Mālavānām Jaya*'—come down to the 2nd century A.D., while V. Smith

<sup>1</sup> J. HP. I., p. 153.

<sup>2</sup> In the *Mudrārākṣasa*, they are referred to as *Malayas*.

<sup>3</sup> Douglas—*On Some Mālava Coins*, pp. 42-47, (Num. Suppl. No. 37).

<sup>4</sup> J. HP. I., p. 218.

<sup>5</sup> S. CCIM., 174.

places *Maraṇa*, *Jāmaka* and others in the 2nd century A.D. and *Paṇa* in about 300 A.D. Why two series of coins were simultaneously issued remains an enigma. Only plausible suggestions can be made to explain this state of things. We find in the case of some of the tribal issues that these generally had names of the tribe and the executive head (or president) side by side, and sometimes bore the name of the Rājanya or executive head only e.g. Rājanya Mahimitra. In the case of the Mālavas the coins were merely tiny pieces and too small to have the name of the tribe and the head of the state side by side, though we find that on occasions the attempt was made (Smith's coin No. 70). Therefore the Rājanyas issued the coins in their names, also in the name of the tribe of which they were the executive heads. That they were hard-pressed for space is evident from the fact that the word 'Mahārāja' is generally contracted into one letter 'Ma'; and in some cases the last letter is not properly drawn.<sup>1</sup> Another suggestion that can be made is that the coins with the names of princes are those belonging to the feudatory chiefs of Karkota Nāgar who were the subordinate chiefs of the Mālava tribe that had extensive territorial possessions in this region. But this conclusion can be drawn in case the coins with personal names are confined only to that particular town, and the coins with tribal names are found scattered around it. The matter, however, must be left for further investigation.

The personal names in the coin legends are very peculiar and 'are so many puzzles'.<sup>2</sup> Jayaswal's view that these are abbreviations seems to be the only correct interpretation. The names are surely 'odd', but to take them to be of foreign origin has no justification. The legends are in Brāhmī and in the language of the country; and if we accept Jayaswal's suggestion many of them, though not all, are found to be of Sanskrit origin and perfectly intelligible. Jayaswal takes the letter 'ma' to be the abbreviation for the word 'Mahārāja' and out of the twenty names in Smith's catalogue, eleven are preceded by this letter. The Mālava coins bear a great deal of resemblance to the coins of the Nāgas; and there also we find that abbreviations were necessitated by the limited nature of the space for the legends e.g. 'Mahārāja Gaṇa' for Mahārāja Gaṇendra'.

The Mālava coins are generally very small. A coin in Smith's catalogue (No. 106) 'is one of the smallest coins in the world'; it weighs only 1.7 gr. and has a diameter of .2 inch. The small size of these coins and the metal used (copper) clearly testify to the poverty of the community that was served by them. It is also evident that the Mālavas had very little intercourse with the outside world as these coins are obtainable only at Nāgar and its immediate neighbourhood. It was thus a

<sup>1</sup> S. CCIM., Nos. 71, 73, 86, 99, etc.

<sup>2</sup> J. HP. I, p. 218.



peculiar coinage which merely served the necessities of a community on a low economic level. I follow Smith's classification as the most convenient for reference, though with necessary modifications.

Class A. With the Tribal Name.<sup>1</sup> AE.

Group 1. (a) Second Century B.C. (circular).

The eleven coins in this group are assigned to the second century B.C. by V. Smith. In determining the date of these coins, he relies upon Nos. 1 and 11. These two coins may be ascribed to the 2nd century B.C. on palæographical grounds, and they may belong to that early period as the legend is in Prākṛit—*Mālavāṇa Jaya* in coin No. 11; and the legend in No. 1 also should be read *Mālavāṇa* instead of *Mālavā* (*nām*), as proposed. The other coins with legends in Sanskrit of the classical style must be assigned to a very much later date, perhaps 2nd century A.D.

(i) *Obv.* : *Mala*, Tree in railing.<sup>2</sup>

*Rev.* : *Nandipada* Symbol.

The word 'Mala' is taken by Mr. Douglas to be the name of the 'original founder of the tribe'. So these coins assuredly belong to the earlier series.

(ii) *Obv.* : *Mālaya*.<sup>3</sup>

*Rev.* : Obscure, irregular dots. 'Mālaya' might have been derived from 'Mala'—meaning 'the tribe of Mala'.

(iii) *Obv.* : *Hill* Symbol (so-called '*chaitya*' of three arches) : above, *Jaya* in large old characters.<sup>4</sup>

*Rev.* : Radiate sun and another symbol : legend—*Mālavāṇa*, in 2nd century B.C. script (Smith).

Group 1. (b) 100 B.C.—100 A.D. AE.

*Obv.* : Legend *Mālāva*.

*Rev.* : A zig-zag line (snake or river ?) and a *Nandipadu* symbol. (Smith—Nos. 7 and 8).

Group 1. (c) 100 A.D.—200 A.D.

(i) *Obv.* : Legend *Mālavānām Jaya* in classical Sanskrit.

*Rev.* : Obscure. (Coins Nos. 2, 3, 5, 6 and 9—Smith).

(ii) *Obv.* : Conventional tree in railing with *ja* 1. and *ya* r.

*Rev.* : Perhaps the legend—*Mālavānām*.

Group 2. With *Vase* rev.<sup>5</sup> (circ.) AE.

*Obv.* : *Mālava jaya* in script of 2nd century B.C. (?).

*Rev.* : *Vase* in dotted circle.

<sup>1</sup> S. CCIM., pp. 161-64 and 170-78.

<sup>2</sup> S. CCIM., p. 174; Douglas, R. O.—*On Some Mālava Coins*, p. 45 (coin No. 2).

<sup>3</sup> *Ibid.*, No. 1.

<sup>4</sup> S. CCIM., 171 (coin No. 11). The coin No. 1 also belongs to the same type; the legend should be read as *Mālavāṇa* and not *Mālavā* (*nām*). The other nine coins of this group must be considered to be of a much later date.

<sup>5</sup> S. CCIM., p. 171.

Group 3. *Tree and Vase Type* (rec. and circ.). AE.

*Obv.*: Tree in railing in centre; legend—*Malavaṇa jaya*. The other variants are *Malava jaya*, *Mālavāṇā jaya*, *Mālavāṇa jaya* (or *jayo*), *Mālavāṇa jaya* or *Malavahṇa jaya*. It is the Prākṛit form and may be dated in the 1st century B.C. or A.D. The variants of the legend may supply a chronological clue, if we could only determine the order of these linguistic variations with the lapse of time.

*Rev.*: Vase in dotted border.

Group 4. With *Lion* rev. (rec.). AE.

*Obv.*: The legend—*Mālava jaya* and other variants.

*Rev.*: Lion standing 1.

Group 5. With *Bull* rev. (rec. & circ.). AE.

*Obv.*: *Malavahṇa jaya* and other variants.

*Rev.*: Humped Bull walking 1.

These coins seem to be of a later date, perhaps 1st century A.D. Coins Nos. 41, 47 and 49 in Smith's catalogue clearly do not belong to this type. In No. 57 the legend is reversed; it is to be read from right to left, and this is surely of an earlier date, perhaps 2nd century B.C.

Group 6. *King's head* rev. (circ.). AE.

Mr. Douglas seems to be correct in his statement that coins Nos. 58, 59, 60 and 72a in Smith's catalogue are really Nāga coins. No. 61 is a Mālava coin but cannot be included in this group, as its *rev.* is very obscure. The similarity of the coins of this group with the Nāga coins was recognised by Smith also.

*Obv.*: The legend should be read as—*Mahāgaṇasa jaya*, i.e. 'Victory to Mahārāja Gaṇapati'—distinct points of similarity in design between them and the coins of Mahārāja Gaṇapati of Nāga'.

*Rev.*: King's head r. with curly hair. Prof. Rapson does not accept Smith's identification. Really it is very difficult to recognise the type as a 'curly head'; it may be a 'fantail peacock'.

Group 7. *Fantail Peacock* rev. AE.

These coins are of an early date, perhaps 2nd century B.C.; the letters read from right to left.

*Obv.*: The central device is very obscure, it is not possible to accept Smith's opinion that it stands for a female figure (Smith—No. 63). The legend seems to be *Mālava gaṇasya jaya*.

*Rev.*: Peacock facing with expanded tail, covering the whole surface of the coin.

Group 8. *Miscellaneous Devices*. AE.

Some of the coins are of an early date. Coin No. 66 is assigned to the 2nd century B.C. by Smith; No. 67 also belongs to the same period at least, as it has the legend 'Mala'; Nos. 67a and 67b are of a much later date and No. 64 perhaps belongs to the 2nd century A.D. This group has two coins with tree on the *obv.* and one with an open lotus flower.

In three other coins, we have only the variants of the 'Mālava' legend. On the *rev.* Smith identified a Nandipada; but a snake, a peacock and a solar symbol as suggested by him cannot be made out.

Class B.—With the names of Mālava chiefs (?).<sup>1</sup> AE.

(a) The Early kings—100 B.C. or earlier.

(1) *Bhapaṃyana*, or *Bhampāyana* (Jayaswal), c. 200 B.C. The 'tree in railing' Type. The animal on the *rev.* seems to be a recumbent Bull and not a lion or tiger as suggested by Smith. (Coin No. 68).

(2) *Yama* or *Maya*.—2nd century B.C.

The 'Tree in railing' Type; on the *rev.* 'Mālava' Symbol; I do not find the snake (Smith No. 69).

(3) *Majupa*, i.e. Mahārāja *Jupa* (Yūpa). The legend in two lines—(i) *Malarā*, (ii) *Majupa*, both read from right to left. The *rev.* is obscure, perhaps a lion. It is an early coin (200 B.C.), *Jupa* was surely a Mālava chief (Smith—No. 70).

(b) From c. 100 B.C.—100 A.D.

(1) *Mapojaya*. Jayaswal takes it to be Mahājaya i.e. Mahārāja *Jaya*. Two Types of coins—(1) with lion *rev.* (No. 71). and (ii) with elephant *rev.* (No. 72); the single line legend on the *obv.* *Mapojaya* or *Mahājaya* (?).

(2) *Mapaya*, or Mahārāja *Paya*, perhaps the same man as *Paya* and therefore of a later date—acc. to Smith c. 300 A.D. Type (i) Humped Bull *rev.* and single line legend *Mapaya* *obv.* (Smith—Nos. 73–78); (iii) the same *obv.* but lion *rev.* (?) (No. 79). No 72a is a Nāga coin and referred to above.

(3) *Magajasa* is the abbreviation of Mahārāja *Gajasa*.—'Of Mahārāja *Gaja*'. (4) *Magaja* is the identical name—'Mahārāja *Gaja*'. So the coins Nos. 80–84 (Smith) may be taken to be the coins of one and the same king. Type—(i) *obv.* *Magajasa*; *rev.* defaced. (Nos. 80 and 81); (ii) *Obv.* *Magaja*; *rev.* elephant or obscure (Nos. 82–84).

(5) *Magojava*, or *Magajava* (Jayaswal), i.e. Mahārāja *Gajava* (*Gajapa* ?). Perhaps this name is identical with *Gajava*; Legend—*Magojava* *obv.*; Lion sitting *rev.* (Nos. 85–87).

(6) *Gajava* (*Gajapa* ?). Perhaps identical with king No. 5; Legend *Gajava* on *obv.*; and Lion (?) *rev.*

(7) *Gojara*.—Legend *Gojara* *obv.*; and animal running *rev.* (No. 88).

(8) *Māsapa*, or *Masapa* or Mahārāja *Sarpa* (Jayaswal)—the legend *Māsapa* on the *obv.*; defaced *rev.*

(9) *Pachha*. Legend *Pachha* on the *obv.*; and king's head (?) *rev.*

(10) *Magachha* or Mahārāja *Gachha*: the Bull Type—the legend *Magachha* on the *obv.*; and Bull l. on the *rev.* (No. 94)

(11) *Jampaya*.—The Legend *Jamapaya* on the *obv.*, the blank or defaced *rev.* (No. 99).

(c) The Late Period—c. 100 A.D.—300 A.D.

(1) *Yama*,—the second of this name. A two-line legend—(a) *Yama*, (b) illegible; and a Bull on the *rev.*; about 100 A.D. (No. 92).

(2) *Jāmaka*,—the legend—*Jāmaka* on the *obv.*; and *rev.* defaced. (No. 98).

(3) *Mahārāja*,—the legend in two lines,—(a) (*Ma*)*h* (ā), (b) *rāja*; *rev.* blank or defaced—2nd century A.D. (No. 101).

(4) *Maraja*—Legend *Maraja* *obv.*; Bull *rev.* (Nos. 102 and 103). It is perhaps an abbreviation for *Mahārāja*; and *Mahārāja* may be the name of the same king, specially as the coin is also dated in the 2nd century A.D.

(5) *Mapaka*,—*Mahārāja Paka*—The Bull *rev.*; and legend *Mapaka* on the *obv.*—2nd century A.D.

(6) *Paya*.—The Bull Type with legend *Paya* on the *obv.* about 300 A.D. For another *Paya* of an earlier date see *Mapaya*; or he may be the same man as the Type is identical, and the characters are of a late date (*Mapaya*, No. 74).

Class C—Without Legend. AE.

(1) *Peacock and the human figure*.

*Obv.*: Peacock facing front with expanded tail.

*Rev.*: Squatted human figure to l. with obscure marks on the r. (No. 104).

(2) *Vase and Bull*.

*Obv.*: Vase containing flowers.

*Rev.*: Bull standing l. (No. 105).

(3) *Palm-leaf and the Vase*.

*Obv.*: Pinnate Palm-leaf.

*Rev.*: Vase: the smallest coin in the collection, only 1.7 gr. in weight and .2 in diameter (No. 106).

(4) *Palm-leaf and the Bull*.

*Obv.*: Pinnate Palm-leaf; *rev.*: Bull standing l. (Nos. 107 and 108).

(5) *Tree in railing*.

*Obv.*: Tree in railing, perhaps with legend *Jaya*; Analogous to coin No. 4 of Smith and similar to coin No. 26 of Douglas.

*Rev.* indistinct.

(6) The Bull with large horns.

*Obv.*: Bull with large horns and spreading ears standing l. *Rev.*: defaced.

(7) *Lotus Flower*.<sup>1</sup>

(a) *Obv.*: 'Mālava' Symbol; *Rev.* Conventional Lotus Flower.

(b) *Obv.*: defaced; *Rev.*: open Lotus Flower.

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<sup>1</sup> Douglas, R. O.—On Some Mālava Coins (Nos. 29 and 30).

VIII. *Sibis*, The.—The *Siboi* were the neighbours of the Mālavas (the Malloi) in the Punjab during the time of Alexander.<sup>1</sup> They are referred to as *Sivis* in the Jātaka and the *Saibyas* by Patañjali who took *Sibi* to be the ‘name of a country or state’.<sup>2</sup> Later on like the Mālavas, they migrated from the Punjab to Rajputana<sup>3</sup> and their coins are found at Nagari near Chitor. These coins bear the name of their country or nation :—*Majhimikāya Sibi Janapadasa*—‘Of the country (or Nation) of the *Sibis* of Madhyamikā’.<sup>4</sup> Madhyamikā therefore seems to be their capital and its identification with Nagari is practically certain.<sup>5</sup> These coins are very rare and the metal is copper.

*Obv.* : The Upper Part of a Trisūla (‘Cross’—Cunningham) in middle with a small symbol in each angle ; to the r. a straight tree rising from a small circle : Legend in Br.—*Majhimikāya Sibi Janapadasa*.

*Rev.* : Hill surmounted by the *Nandipada* with a river symbol below. The coins are earlier than the Christian Era.

IX. *Vimakas*, The.<sup>6</sup>—They are not known from any other source. The coins of their king Rudravarma is included by Cunningham among those of the Audumbaras. It has a great similarity with the ‘Mahadeva’<sup>7</sup> coin and bears the same type. There seems to be some sort of relationship between the *Vimakas* and the Audumbaras ; perhaps they were neighbours.

The *Elephant and Bull Type*. AE.

*Obv.* : The Elephant with upraised trunk moving to r. towards trident battle-axe of Śiva : Br. Legend.

*Rev.* : Humped Indian Bull to r. and a symbol under head ; it cannot be a flower as suggested by Cunningham. It has a great similarity with the symbol on the *rev.* of the Vṛishni coin (C. CAI., Pl. IV, fig. 15) : and I take it to be a *Chakra* or discus. Kh. Legend.

The Legend.—

*Obv.* Br. : rājñavemakisarudravarmasa (v) i . . . .

*Rev.* Kh. : rañave . . . . vu (.) ma—vijayata (sa)<sup>8</sup> = ‘(coin of) king Rudravarma, the Vemaki or Vaimaki—the king of the *Vimakas*, the Conqueror’.

X. *Vṛishnis*, The.—The *Vṛishnis* of old lived at Mathurā. According to the account of the Mahā-Bhārata, they went to Dwarakā when hard-pressed by Jarāsandha.<sup>9</sup> But a branch of it must have remained in the original home ; and in the Śuṅga

<sup>1</sup> J. HP. I, p. 68.

<sup>2</sup> *Ibid.*, p. 153, footnote 3.

<sup>3</sup> *Ibid.*, p. 153.

<sup>4</sup> *Ibid.*

<sup>5</sup> D. GDAMI., p. 116.

<sup>6</sup> JRAS., 1900 (Prof. Rapson), p. 429, footnote 2 ; C. CAI., p. 68, Pl. IV, fig. 6.

<sup>7</sup> *Ibid.*, fig. 5.

<sup>8</sup> JRAS., 1900, p. 412 (Bergny) and pp. 428 and 429 (Prof. Rapson).

<sup>9</sup> D. GDAMI., p. 58 (Dvāravati) ; J. HP. I, p. 77.

times (2nd century B.C.), they issued coins of which perhaps only two remain.<sup>1</sup> But shortly afterwards, they fell under the influence of the Śaka invaders, and Jayaswal comes to this conclusion from the fact that the Brāhmī legend of the coin was coupled with the 'script of the invader' i.e. Kharoshthī.<sup>2</sup> The legend on the coins is a peculiar one, different from that of the republican tribes—the Mālavas, the Ārjunāyanas, the Yaudheyas and others. It is not merely in the name of the Gaṇa but in the name, of the Rājanya and Gaṇa of the Vṛishnis.<sup>3</sup> Jayaswal tried to clear up this difficulty and showed that in the Vṛishni Gaṇa, the executive power was vested in two Rājanyas.<sup>4</sup> The coin in Cunningham's book, Pl. IV, fig. 15 is in silver.<sup>5</sup>

Type—*The Half-Lion and Half-Elephant*. AR.

*Obv.*: A pillar, with half-lion and half-elephant surmounted by a symbol and surrounded by a railing; legend in Brāhmī.<sup>6</sup>

*Rev.*: The same legend in Kh. and the so-called *Dharma-chakra* of Cunningham. Jayaswal has clearly shown that it is the state symbol of the Vṛishnis<sup>7</sup>—the weapon '*chakra* or discus, which was their symbol according to tradition as early as the time of Rājanya Krishna'. Whatever doubt we might have as regards the correctness of the identification is set at rest 'by the cutting edges and the projecting points on the rim'.<sup>8</sup> The Legend<sup>9</sup> :—

*Obv.*: Br. Vṛshṇir(ā)jajñā gaṇasyatratarasya.

*Rev.*: Kh. Vṛishṇira—ṇṇa(ga) . . . (t)ra.—

'Of the Vṛishni Rājanya (and) Gaṇa—the protector of the country (Jayaswal).'

It seems to be a better interpretation to take the compound literally.—

*Vṛshṇi-rāja-Jñāgaṇasya*, 'Of Jñāgaṇa, the Vṛshṇi King'. The name of the king who issued this coin is, therefore, Jñāgaṇa. The word *trātārasya* means 'of the Saviour,' corresponding to Sans. *trātuh*.

XI. *Uddehikas*, The.—The Auddehikas or Auddehikas are mentioned by Varāha Mihira in his *Bṛihat Samhitā* and are placed in the central Region.<sup>10</sup> Prof. Rapson concludes from 'the general similarity between the coins of Uddehika and Eraṇ' that the 'two places were not far apart'. The exact

<sup>1</sup> *Ibid.*, p. 157.

<sup>3</sup> *Ibid.*, p. 40.

<sup>5</sup> C. CAL., p. 70.

<sup>7</sup> J. HP. I, p. 157.

<sup>9</sup> JRAS., 1900, p. 416 (A. V. Bergny).

Studies, p. 398, footnote 2.

<sup>10</sup> JRAS. (1900), pp. 98-102.

<sup>2</sup> *Ibid.*

<sup>4</sup> *Ibid.*, p. 41.

<sup>6</sup> *Ibid.*, J. HP. I, p. 157.

<sup>8</sup> *Ibid.*, footnote 2.

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determination of the locality must await further research. These coins, however, 'mark an interesting stage in the art of coin-making in India'. The symbols instead of being impressed on the coins separately by the different punches are struck from a single die which is made up of a collection of such symbols. The Brāhmī alphabet is of an early period and the coin may safely be assigned to the 3rd century B.C. We have the name of only one king Sūryamitra.

Type No. 1.—The *Humped Bull* Type.<sup>1</sup> AE.

*Obv.*: Humped Bull to r.: above, tree within railing in a horizontal position.

*Rev.*: The Legend in old Brāhmī—*Udchaki*, 'the Prince of the Uddehikas'; three symbols above,—the '*Mālava*' symbol, two *fishes* in a pond, and *tree* within railing.

Type No. 2.—The *Elephant* Type.<sup>2</sup> AE.

*Obv.*: The Elephant to l.; beneath 'five-hooded snake, and (?) tree within railing, both represented horizontally'. The coin is almost obliterated; so the symbols are obscure and doubtful. The countermark is the 'triangular-headed' symbol at top left. This symbol is very common. Prof. Rapson characterises it as a 'curious symbol' which 'occurs so frequently on coins of all kinds—punch-marked, cast and struck—and which no one seems to have explained'. Sometimes it is put within a railing as on many of the coins of Bahasatimitra of Kauśāmbi. There is no doubt that it is an auspicious sign like the *svastika*. The equilateral triangle is the 'symbol of God manifested in the cosmos',<sup>3</sup> and when it stands 'on its apex it signifies expansion or evolution, and like the Swastika, the ascending creative force—or life'.<sup>4</sup> This may explain its general use but what the two small protruding lines on the right of the triangle represent, cannot yet be determined.<sup>5</sup>

XII. *Yaudheyas*, The.—They are included among the *Ayudhajivin Saṅghas* and they are referred to as a '*janapada*, a nation or country i.e. 'a political community'.<sup>6</sup> They 'considered military art as the vital principle of their constitution',<sup>7</sup> and were 'specially noted as warriors'.<sup>8</sup> The word *yaudheya* is derived from *yudha*, battle<sup>9</sup> or from a personal name,<sup>10</sup> though the former one seems to be more acceptable. Pāṇini places them in the Vāhika country<sup>11</sup> along with other republican states. There is no doubt that the Vāhikas were in the Punjab; and Jayaswal takes the word Vāhika to mean 'the country of the rivers',<sup>12</sup> comprising the Sindh valley and the Punjab. Arrian

<sup>1</sup> *Ibid.*, Indian Coins and Seals I, fig. 1.

<sup>3</sup> Havell, E. B.—*The Ideals of Indian Art*, p. 86.

<sup>4</sup> *Ibid.*

<sup>6</sup> J. H.P. I, pp. 35 and 36.

<sup>8</sup> C. CAL., p. 75.

<sup>10</sup> J. H.P. I, p. 134.

<sup>12</sup> *Ibid.*

<sup>2</sup> *Ibid.*, fig. 2.

<sup>5</sup> See chapter on *Symbols*.

<sup>7</sup> *Ibid.*, p. 37.

<sup>9</sup> *Ibid.*

<sup>11</sup> *Ibid.*, p. 38.

mentions a powerful republic on the east side of the Hyphasis or Beas. Their country was very fertile and the inhabitants were agriculturists but brave in war. Jayaswal suggests with reference to the find-spot of the Yaudheya coins that this unnamed republic on the Beas was probably that of the Yaudheyas.<sup>1</sup> Alexander did not cross the river and had no opportunity of testing the military prowess of this renowned people. The Purāṇas give a monarchical constitution to the Yaudheyas.<sup>2</sup> Perhaps the original monarchy was later on replaced by an aristocracy of 5,000 councillors—virtually a republic.<sup>3</sup>

The Yaudheyas survived the Maurya Empire, the Satraps of Mathurā and the Kushanas. The 2nd century A.D. 'was full of their military glory'<sup>4</sup> and they are referred to in Rudradāman's (150 A.D.) inscription. In the 4th century A.D., the Yaudheyas appear in the inscription of Samudragupta as one of the frontier tribes of the Gupta Empire. Perhaps they left their original home during Kushana period and were in Western Rajputana during the time of Rudradāman. Cunningham identified the Yaudheyas with the *Johiyas* of Bhawalpur who 'now occupy the country on both banks of the Sutlej, and the lower Doab between the Sutlej was named after them—the *Johiyabār*'.<sup>5</sup> When the Yaudheyas passed away from history cannot exactly be determined but it is certain that by the 7th century A.D. they were no more.<sup>6</sup> Thus they had a political existence of more than thousand years credited to them.<sup>7</sup> 'The coins of the Yaudheyas are found in the Eastern Punjab, and all over the country between the Sutlej and the Jumna rivers. Two large finds have been made at *Sonpath*, between Delhi and Karnāl'.<sup>8</sup> Some of them were found in the Kāngrā District and a great many at Jogadheri in the Eastern Punjab; and Cunningham procured his silver piece<sup>9</sup> and 300 copper pieces 'between the Sutlej and the Jumna rivers'. So it is evident that the Yaudheya territories were extensive; 'the cities of Lahore, Bhawalpur, Bikaner, Ludhiana and Delhi roughly indicate the limits of the tribal territory'.<sup>10</sup>

The Yaudheya coins fall into 3 classes—(a) The earliest,—'the Bull and Elephant Type' coins have been 'dated a little before or after the Christian era'.<sup>11</sup> These are small copper coins of rough workmanship but have some resemblance 'with the earlier coins of the Audumbaras and the Kunindas', and on this ground Prof. Rapson assigns them to about 100 B.C.<sup>12</sup>; and

<sup>1</sup> *Ibid.*, p. 67.

<sup>3</sup> *Ibid.*, pp. 67 and 74.

<sup>5</sup> C. CAL., p. 76.

<sup>7</sup> *Ibid.*, p. 174.

<sup>9</sup> *Ibid.*, p. 79.

<sup>10</sup> S. Majumdar—Notes on C. AGI., p. 690.

<sup>12</sup> R. IC., p. 15.

<sup>2</sup> J. HP. I, p. 74.

<sup>4</sup> *Ibid.*, p. 149.

<sup>6</sup> J. HP. I, p. 151.

<sup>8</sup> C. CAL., p. 76.

<sup>11</sup> S. CCIM., p. 165.



these may be as old as the Śunga period.<sup>1</sup> (b) The Brahmanya Deva coins are assigned by Smith to the 2nd century A.D. This was the period of their great military glory,<sup>2</sup> and it is but natural that they took Kārttikeya the war-god for their coin type. So it is not possible to accept Prof. Rapson's view<sup>3</sup> that these coins are to be dated after the 'warrior' type. (c) The 'warrior' type coins have surely been imitated from Kushana models,<sup>4</sup> and we can safely accept Smith's view that these were in circulation up to 'the completion of the conquest of Northern India by Chandragupta II about 380 A.D.'<sup>5</sup> These copper coins are big in size and better executed than the rude coins of class (b). It appears that the Yaudheyas were divided into 3 distinct clans,<sup>6</sup> and those of the second and third clans were 'distinguished by numeral syllables and special symbols'.<sup>7</sup> Some coins have 'dvi' (two) and some 'tri' (three), and these obviously refer to their three sections. The coins of the third class are 'the least numerous'.<sup>8</sup>

Type No. 1. The *Bull and Elephant Type*<sup>9</sup> (c. 100 B.C.). AE.

*Obv.*: Bull standing r. facing a curved object (the national standard ?) within a railing. 'early' Br. legend—*Yadheyana*, (Yaudheyānām), 'of the Yaudheyas'.<sup>10</sup> In some of the specimens, there is another legend under the Bull which no body has been able to read: it seems to end in *me*.<sup>11</sup> In other coins of the same type in brass or similar alloy occurs the legend—*Kri . . . . . ya(dhe)yaṇa*<sup>12</sup>: the second word *Yadheyana* is certain and for the first word various suggestions are made—(a) *Kripadhanaba* (Rodgers); (b) *Bhūmidhanusha* (Cunningham); (c) *Bhūpadhanusha* (Smith), and (d) *Bahudhaṇake* (Rapson).<sup>13</sup> Smith is almost positive about the reading *Bhūpadhanusha*, and as this word means 'of the Lord of the Desert' and seems to fit in with the locality of the Yaudheyas, its correctness is beyond doubt. But there may be several varieties of this inscription as pointed out by Prof. Rapson.

*Rev.*: Elephant walking r.; *nandipada* symbol above and a 'scythe-like' object.<sup>14</sup> In some specimens the curved line under the elephant is clear.<sup>15</sup>

<sup>1</sup> J. HP. I, p. 150.

<sup>2</sup> R. IC., p. 15 (Sec. 60).

<sup>3</sup> *Ibid.*

<sup>4</sup> S. CCIM., p. 165.

<sup>5</sup> S. CCIM., Pl. XXI, 13 and 14, pp. 180 and 181; C. CAI., Pl. VI, figs. 2-4; R. IC., Pl. III, 13.

<sup>6</sup> S. CCIM., p. 180 (No. 1).

<sup>7</sup> *Ibid.*, p. 181 (No. 5).

<sup>8</sup> JRAS., (1900), p. 107, footnote 1. Recently coin moulds bearing the legend *y(au)dheyāna bahu-dhaṇake* have been found at Khokra Kot near Rohtak by Dr. Birbal Sahni (*Current Science*, May 1936, p. 796ff.).

<sup>14</sup> *Ibid.*, p. 180 (No. 3), Pl. XXI, 13.

<sup>2</sup> *Ibid.*, p. 149.

<sup>4</sup> *Ibid.*, S. CCIM., p. 165.

<sup>6</sup> J. HP. I, pp. 145 and 160.

<sup>8</sup> *Ibid.*

<sup>11</sup> *Ibid.* (No. 2).

<sup>15</sup> C. CAI., Pl. VI, fig. 3.

Type No. 2. The *Three Symbols* Type.<sup>1</sup> AE.

Two coins are included by Cunningham among those of the Yaudheyas; one of them he found at Behat with other Yaudheya coins. These might be earlier than the 'Bull and Elephant' Type, but the identification is not absolutely certain. One of them is a single-die coin<sup>2</sup> with only three symbols; the other is broken, has three symbols, and part of a legend in indistinct Br. characters.<sup>3</sup>

*Obv.*: The Three Symbols.—Tree in railing in the middle is common. In the single-die coin, the symbol to the l. is one of four circles ('Mālava' Symbol) and the other on the r. is perhaps a conventional tree like the symbol in coin No. 3 of Balabhūti of Mathurā (S. CCIM., p. 192). The double-die coin has the 'triangular-headed' symbol on the l. and a circular object (*chakra*!) on the r.; and inscription only partly legible—*Mahārāja(sa)*. The *rev.* indistinct perhaps a few letters.

Type No. 3—The *Brahmanyadeva* Type.<sup>4</sup> AR. and AE.

Var. a.—Second Century A.D.

*Obv.*: Six-headed god (*Kārttikeya*) standing on lotus facing with l. hand on hip and r. hand raised and a barbed spear on the l.; the legend completed from a number of coins,—*Bhāgaratah svāmīno Brahmanyadevasya*, 'coin of (dedicated to) Almighty Lord Brahmanyadeva'. Here Brahmanyadeva is not the name of a king as presumed by Smith.<sup>5</sup> It is surely the national god *Kārttikeya*<sup>6</sup> the war-god, to whom the warlike Yaudheyas dedicated their coins. Whatever doubt we might have is set at rest by the substitution of *Kumarasa*,<sup>7</sup> another name of *Kārttikeya* for Brahmanyadevasya in some of the coins. In a few of these coins, the legends end in words like *drama*, *dama* or *darma*. V. Smith was not sure about its meaning and could not explain it<sup>8</sup>; it is however only a variant of the Greek word *drachm*, signifying here 'a coin'. In some specimens the god stands on a pedestal,<sup>9</sup> and a vase also occurs in the r. field in a few cases.<sup>10</sup> *Rev.*: Six-headed figure standing on lotus, facing, tree in railing r. and the so-called *chaitya* with umbrella (the *Hill* symbol) and *nandipada* above it on the l.<sup>11</sup> In some specimens the figure stands on a bent line,<sup>12</sup> and in others it

<sup>1</sup> C. CAI., p. 77, Pl. VI, figs. 1 and 5.

<sup>2</sup> *Ibid.*, Pl. VI, fig. 1.

<sup>3</sup> *Ibid.*, Pl. VI, fig. 5.

<sup>4</sup> S. CCIM., pp. 181-82, Pl. XXI, 15-17; C. CAI., p. 78, Pl. VI, figs. 9-12; R. IC., Pl. III, 15.

<sup>5</sup> S. CCIM., p. 181, footnote 1.

<sup>6</sup> R. IC., Pl. III, 15; J. HP. I, pp. 150 and 218. On the second type they give the representation of God *Kārttikeya*, the presiding deity of Heroism and War and name him on the coin. In fact the coin itself is significantly dedicated to the Deity of Heroism. In other words the figure is their *La Liberté*."

<sup>7</sup> S. CCIM., p. 182 (Coin Nos. 15-17).

<sup>8</sup> *Ibid.*, p. 182, footnote 1.

<sup>9</sup> S. CCIM., pp. 181-82 (Nos. 9 and 17)

<sup>10</sup> *Ibid.*, p. 182 (No. 15).

<sup>11</sup> *Ibid.*, p. 181 (No. 8).

<sup>12</sup> *Ibid.*, (No. 9).

has only one head radiate.<sup>1</sup> V. Smith takes the figure to be a goddess but his identification does not appear to be correct. It seems to be a male figure and may represent *Kārttikeya*. But in one of the coins (C. CAL., Pl. VI, fig. 12)<sup>2</sup> the figure is single-headed radiate and is undoubtedly a female. What it stands for cannot be definitely ascertained. It must be a goddess worshipped by the Yaudheyas. Among the symbols,—*svastika*<sup>3</sup> also appears in some coins.

Var. b.<sup>4</sup> *Obv.* : As in Var. a.

*Rev.* : Quadruped, perhaps stag standing to r. ; above a (?) shrine with curved roof,<sup>5</sup> or a *chaitya* (Hill) to r. and a symbol above and the wavy line (the snake or river).<sup>6</sup>

The *Brahmaṇyadeva Type II.*<sup>7</sup> AE.

*Obv.* : Single-headed god (*Kārttikeya*) radiate facing, vase to r. : Legend—*Brahmaṇyadevasya drama*, 'the coin of Brahman-yadeva'.

*Rev.* : Quadruped (Stag ?) standing l. facing (?) *Tree*, *Vase* with streamers on the r. and a *dotted circle*.<sup>8</sup> In another coin, we have in the place of 'the vase and circle' a crescent and the zig-zag line (river ?) below.<sup>9</sup>

Type No. 4. The *Warrior Type*.<sup>10</sup> AE. (2nd century A.D.).

Var. a. No *Obv.* numeral, and no *rev.* symbol.<sup>11</sup>

*Obv.* : A Warrior standing, facing f. grasping spear in r. hand with l. hand on hip ; peacock at his l. foot ; Br. legend—*Yadhayaganasya jaya*, (*Yaudheyaganasya jaya*), 'Victory to the Yaudheya tribe'. This figure of a warrior with a spear 'in the pose of a dignified 'tri-bhaṅga' represents the type of their citizen-soldier'.<sup>12</sup>

*Rev.* : A robed male figure walking l. with r. hand extended and l. hand on hip, like *Miirō* on Kushana coins ; dotted circle.

Var. b. Numeral *Dvi* on *obv.* ; *Vase* on *rev.*<sup>13</sup>

*Obv.* : As in Var. a. ; the numeral '*dvi*' (second) over r. shoulder.

*Rev.* : As in Var. a. : Vase containing leaves (not flowers) in l. field and a symbol 'with three points and three dots' in r. field. The 'Vase with leaves' is even now used in Hindu religious ceremonies and is looked upon as an auspicious object.

Var. c.—Numeral '*Tri*' on *obv.* ; Shell on *rev.*<sup>14</sup>

<sup>1</sup> *Ibid.*, (No. 16).

<sup>2</sup> C. CAL., p. 78.

<sup>3</sup> S. CCIM., p. 181 (No. 9).

<sup>4</sup> *Ibid.*, p. 182 (No. 20) ; C. CAL., Pl. VI, fig. 13.

<sup>5</sup> S. CCIM., p. 182 (No. 20).

<sup>6</sup> C. CAL., Pl. VI, fig. 13.

<sup>7</sup> S. CCIM., p. 182 (Nos. 18a, 18b, and 19).

<sup>8</sup> *Ibid.*, (No. 18b).

<sup>9</sup> *Ibid.*, (No. 19).

<sup>10</sup> *Ibid.*, pp. 182-83, Pl. XXI, 18-20 ; C. CAL., Pl. VI, 6-8 ; R. IC., Pl. III, 14.

<sup>11</sup> S. CCIM., Pl. XXI, 18.

<sup>12</sup> J. HP. I., p. 150.

<sup>13</sup> S. CCIM., Pl. XXI, 19 ; C. CAL., Pl. VI, 7 ; R. IC., Pl. III, 14.

<sup>14</sup> S. CCIM., Pl. XXI, 20 ; C. CAL., Pl. VI, 8.

*Obv.* : As in Var. a. and b. ; *tri* (third) over r. shoulder.

*Rev.* : As in Var. a. and b. ; *Shell* instead of Vase ; Shell is also an auspicious object ; and a symbol composed of 'two zig-zag lines with a line between'. The numerals *Dvi* and *Tri* refer to the second and third sections of the Yaudheya Gaṇa.

XIII. *Rājanya Janapada*.<sup>1</sup>—The identification of Rājanya coins was long delayed due to the wrong reading of the first word as *Rājña* or *Rajña*.<sup>2</sup> V. Smith read the three letters as *Rajana* and took it to be equivalent to Sanskrit *rājaṇya* or *Kshatriya*.<sup>3</sup> He explained the legend *Rajaña janapadasa*<sup>4</sup> as meaning 'coin of the Kshatriya country'. But Mr. Jayaswal was the first to correct this mistake. He takes *Rājanya* as 'the proper name of a political people'.<sup>5</sup> They came on the scene about 200–100 B.C. and issued coins in the name of their country. The Rājanyas as a people are referred to in 'Pāṇini, Kātyāyana and Patañjali and also by the Mahā-Bhārata'.<sup>6</sup> Rājanya coins are procurable in Mathurā<sup>7</sup> ; so Smith takes their territory to be not far from that city and locates it 'in some part of eastern Rājputana', perhaps in Dholpur State.<sup>8</sup> But as 'coins of this type are found on the Manaswāl plateau, Hoshyārpur District',<sup>9</sup> Mr. Jayaswal presumes this to be their home.<sup>10</sup> The type of these coins is closely related to that of the Northern Satraps of Mathurā<sup>11</sup> and the legends are either in Kh. or Br. Prof. Rapson thinks that the coins with Kh. legends belong to an earlier date<sup>12</sup> and the Rājanya coins are ascribed to 2nd or 1st century B.C.

Type No. 1. *Standing Figure Type*.<sup>13</sup> AE.

Var. A. With *Kharoshthī* legend (cast or die-struck).

*Obv.* : Standing figure, perhaps a deity, with r. hand raised, as on N. Satrap coins ; Kh. legend—*Rajaña janapadasa*, (coin) of the Rājanya Janapada.

*Rev.* : Humped Bull standing l., a symbol above ; die-struck and extremely rare.

Var. B. With *Brāhmī* legend.<sup>14</sup> AE.

*Obv.* : Similar ; same legend in Br.

*Rev.* : Bull standing l. in a rayed circle ; cast in high relief (No. 2—Smith), or die-struck (No. 3—Smith).

Type No. 2. *Tree in railing and Lion Type*.<sup>15</sup> AE.

*Obv.* : Tree in railing Br. legend . . . (?) Janapada(sa).

*Rev.* : Lion standing l., facing (?) a post ; indistinct Br. legend, perhaps including *Rājño*.

<sup>1</sup> R. IC., p. 12 (Sec. 47).

<sup>2</sup> S. CCIM., p. 164.

<sup>3</sup> J. HP. I., p. 158.

<sup>4</sup> S. CCIM., p. 164.

<sup>5</sup> *Ibid.*

<sup>6</sup> R. IC., p. 12 ; S. CCIM., p. 165.

<sup>7</sup> S. C. CCIM., p. 179 (No. 1).

<sup>8</sup> *Ibid.*, p. 180 (No. 8).

<sup>9</sup> C. CAI., p. 89.

<sup>10</sup> *Ibid.*

<sup>11</sup> *Ibid.*,

<sup>12</sup> *Ibid.*, p. 165.

<sup>13</sup> J. HP. I., p. 159.

<sup>14</sup> R. IC., p. 12.

<sup>15</sup> *Ibid.*

## ABBREVIATIONS.

1. ASI-AR.—The Archaeological Survey of India—Annual Report.
2. ASB.—The Asiatic Society of Bengal.
3. C. ASR.—Cunningham, A.—The Archaeological Survey Report.
4. C. AGL.—Cunningham, A.—The Ancient Geography of India (Calcutta, 1924).
5. C. CAI.—Cunningham, A.—The Coins of Ancient India.
6. CHI.—The Cambridge History of India, Vol. I.
7. D. GDAMI.—Dey, M.—The Geographical Dictionary of Ancient and Mediæval India.
8. JRAS.—The Journal of the Royal Asiatic Society of Great Britain and Ireland.
9. JBORS.—The Journal of the Bihar and Orissa Research Society.
10. J. HP. I.—Jayaswal, K. P.—Hindu Polity, Vol. I.
11. S. CCIM.—Smith, V. A.—The Catalogue of Coins in the Indian Museum, Calcutta.

## THE TRIBES : THEIR TYPES AND SYMBOLS.

*Types.* Animals—

- (a) Bull : (i) Humped, (ii) without Hump, (iii) recumbent.—Audumbaras : (i). Arjunāyanas (i). Mahārāja Janapada (i). Mālavas (i), (ii) and (iii). Vimakas (i). Uddehikas (i), Yaudheyas (i), Rājanyas (i), and Nāgas (iii).
- (b) Camel : Arjunāyanas.
- (c) Elephant : Arjunāyanas. Audumbaras. Mālavas, Vimakas, Vṛishṇis (Half-Elephant). Uddehikas, Yaudheyas.
- (d) Lion : Mālavas, Rājanyas.
- (e) Stag : Kuṇindas, (Almora Branch). Mālavas, Yaudheyas (?).
- (f) Half-Lion and Half-Elephant : Vṛishṇis.

Bird : Fantail Peacock—Mālavas.

## Tree—

- (a) Pinnate Palmleaf—Mālavas.
- (b) Tree-in-Railing—Mālavas. Rājanyas, Audumbaras. Human Figure—Standing. Arjunāyanas, Aśvakas, Audumbaras, Mahārāja Janapada, Yaudheyas (warrior), Rājanyas : Mālavas (squatted).

## Weapons—

- (a) Chakra—Vṛishṇis.
- (b) Triśūla—Sibis.
- (c) Wheel—Kulūtas, Nāgas.

## Religious—

- (a) Chatreśvara Type—Kuṇindas.
- (b) Brahmanyadeva Type—Yaudheyas.
- (c) Viśvāmitra Type—Audumbaras.
- (d) Vase—(with leaves), Mālavas.
- (e) Sun—(?) Audumbaras (perhaps Pañchāla coin).

(f) Temple—Audumbaras.

(d) A Scythe-like object—Yaudheyas (Smith—No. 3) uncertain.



(e) Symbol with three points and Three dots (?) No. 27.  
(Smith)—Yaudheyas.



King's Head—(?) perhaps Fantail Peacock—Mālavas.

Warrior—Yaudheyas.

*Symbols. Animals—*

(a) Bull,—Rājanyas, Nāgas (recumbent), Mālavas.

(b) Elephant—Mālavas.

(c) Lion—Rājanyas, Mālavas.

(d) Snake—Mālavas, Uddehikas (five-hooded).

Birds—

(a) Cock (or peacock)—Yaudheyas.

(b) Peacock—Mālavas, (also fantail).

Tree—

(a) Tree-in-Railing.—Audumbaras, Kuṇindas. (Kuṇinda Branch of Almora). Sibis (rising from a circle), Rājanyas, Mālavas, Uddehikas, Yaudheyas, or (conventional).

(b) Lotus flower—(open or conventional) Mālavas, Audumbaras (?).

(c) Pinnate Palm-leaf,—Mālavas.

Human Figure—

(a) Female with left hand on hip—Kuṇindas, Mālavas ?  
(No. 63—Smith's Catalogue).

(b) Squatted—Mālavas.

Weapons—

(a) Chakra—Vimakas, Yaudheyas.

(b) Triśūla—Audumbaras (their Standard ?), Vimakas.

National Standard—

(a) Triśūla or Trident Battle-Axe.—Audumbaras.

(b) Pillar with Svastika,—Audumbaras.

(c) Shaft surmounted by a Wheel—Audumbaras.

(d) Curved object within Railing—Yaudheyas.

Hill—(so-called Chaitya)—Aśvakas, Kulūtas (peculiar), Kuṇindas (with Umbrella), Sibis, Yaudheyas, Mālavas.

(b) Pile of Balls,—Aśvakas.

## Auspicious Objects—

- (a) Shell—Yaudheyas (Section *Tri*).  
 (b) Vase—Kunindas (with flower or leaves), Yaudheyas (with Umbrella). Kunindas.

## Auspicious Signs—

- (a) Mālava (or Ujjain) Symbol—Mālavas, Uddehikas, Yaudheyas.



- (b) Nandipada—Aśvakas, Audumbaras, Kulūtas, Kunindas, Sibis, Vṛishṇis, Yaudheyas.



- (c) Svastika—Aśvakas, Kulūtas (curved). Kunindas, Yaudheyas.



- (d) Triangular—headed Symbol—Kunindas, Uddehikas, Yaudheyas.



- (e) Two S's with a line between—Kulūtas, Kunindas, Yaudheyas.



## Solar etc.—

- (a) Radiate sun—Mālavas.  
 (b) Crescent—Mahārāja Janapada, Yaudheyas.  
 Wavy Line—(Vine branches ?) Aśvakas.  
 Zig-zag Line—Aśvakas (river) Audumbaras, Kunindas (ornamental ?), Sibis, Mālavas, Yaudheyas (snake or river ?).

## Various—

- (a) A Disc surrounded by dots—Kunindas (mint-mark ?)  
 (b) Wheel surrounded by dots—Kulūtas.  
 (c) Circle with dots around—Yaudheyas.

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S. K. CHAKRABORTTY.





### 336. COINAGE OF THE NIZAMS OF HYDERABAD.

The decline of the Mughal Power in India after the death of the Emperor Aurangzeb was the signal for the rise and establishment of various independent monarchies throughout India. Subhedars or Governors of different provinces under the supreme power declared their independence and the Mughal Emperors were too weak to exercise any control over them. Nadir Shah's invasion in 1739 during the reign of Muhammad Shah made the case still worse for the Emperors until at last they were Emperors merely in name while the real authority, even at the Capital and the surrounding districts, was in the hands of the Vazirs or the Marathas and subsequently of the English.

In these circumstances, the Nizam's power in the Deccan was brought into being. Nizamulmulk the last of the Governors of Deccan founded the present dynasty. He declared himself independent in 1721 (1133 A.H.) and by virtue of his valour and statesmanship laid the foundations of his State so strong that it has remained almost undisturbed to this day, and is now premier among Indian States. In accordance with the decision of the Paramount power, mints of almost all the Indian States had to be closed down in 1900 but that of the Nizam State continues to issue its own currency.

It is somewhat strange that no single article or notice of the coins of the Hyderabad State has yet appeared in the Numismatic journals. Even the exhaustive Catalogue of the coins of Indian States in the Indian Museum, Calcutta, has failed to notice these coins. I, therefore, deemed it proper to bring some of my observations on the Coinage of this Premier Native State of India to the notice of the Numismatic Society of India.

The following is a list of rulers of the dynasty :—

1. Nizamulmulk Asafjah	..	Ruled from	1133 to 1161 Hijri.
2. Nawab Mir Ahmadkhan	..		1161 to 1164 ..
Nizamuddaulah Nasirjung.			
3. Muzaffarjung Sadullah Khan..	..		1164 (2 months).
4. Nawab Syed Muhammad Khan	..		1164 to 1175 Hijri.
Asafuddaulah Salabatjung.			
5. Nawab Mir Nizam Ali Khan	..		1175 to 1218 ..
Bahadur Asafjung (Asafjah II).			
6. Nawab Mir Akbar Ali Khan	..		1218 to 1244 ..
Sikandarjah (Asafjah III).			
7. Nawab Mir Farkhunda Ali	..		1244 to 1273 ..
Khan Nasiruddaulah (Asafjah IV).			
8. Nawab Mir Tahniyat Ali Khan	..		1273 to 1285 ..
Bahadur Afzaluddaulah			
(Asafjah V).			

9. Nawab Mir Mahboob Ali Khan Ruled from 1285 to 1330 Hijri.  
(Asafjah VI).  
10. Nawab Mir Usman Ali Khan „ 1330 to this day.  
(Asafjah VII).

As has been pointed out by me in my paper on Non-Mughal Mints of Shah Alam II read before the Seventh Oriental Conference at Baroda, coins were struck during the late Mughal period by the local authorities in the Emperor's name from various mint towns with distinctive marks of their own, though the Emperor had no control over the mints. The reason for this continuance of the Emperor's name seems to be the apprehension of the revival of the Mughal Power and the dislike of a change in the currency by the public who still cherished a vague notion of the supreme authority of the Mughal Emperor.

The common stamp of the Mughal Emperor's name on the coins gave them currency throughout India in spite of the diversity. The same held good in case of the Nizam's dominions at Hyderabad. A reference to page 32 of *Tarikhe-Rashiduddin-khani*, the report of the Subhedar of Aurangabad about the current coinage as published in the *Aurangabad Gazetteer*, page 727 and *Bustan Asafia*, page 162 would show that no less than 40 varieties of rupees and about a dozen varieties of copper coins were current in the Nizam's State till about 40 years ago.

There is nothing in the Coinage that could distinguish the Coinage of the Nizam from that of the others till 1218 A.H. when Sikandarjah introduced the Persian letter س on the coins. A coin with legend, dates and name of the ruling Mughal ruler with the above letter has therefore to be assigned to Sikandarjah and similarly his successor Nasiruddaulah's coins are distinguished by the initial letter ن of his name on the then current coins. His successor Afzaluddaulah continued the same practice on his coins by introducing ا as the initial letter of his name.

It was during this ruler's reign that the mutiny broke out and the Mughal Power was finally overthrown. This encouraged most of the Native States to abolish the Mughal Emperor's name and legend prevalent hitherto on the coins and to substitute it with their own. The Nizam's Coinage was not an exception. Asafuddaulah also introduced a separate coinage for his own State wherein the Mughal Emperor's name was not to be seen.

The coins prevalent up to the mutiny had سکه مبارک شاه or محمد بهادر شاه بادشاه غازی on the obverse and جلوس س with or without the letters د or ا and the mint mark on the reverse.

This was substituted by Asafuddaulah from 1275 A.H. with coins having the following legend :—

۹۲	}	on the obverse.
آصف جاہ نظام الملک بہادر		
۱۲۷۵		
سنہ		
and		
جلوس	}	on the reverse.
۲		
میمنت مانوس		
حیدر آباد		
ضر ب		
فرخندہ بنیاد		

Rupees, half rupees, quarter rupees and even two annas and an anna pieces of this type and legend seem to have been issued in silver. Copper pieces of half anna and quarter anna were also issued with the same legend. Gold coinage seems to be rare and it appears that these Mohurs or Ashrafis were struck only at auspicious or important occasions by the ruler or the nobles in the State mint and their values differed from time to time according to the gold rate. Gold coinage bore the same legend as the silver one.

This sort of coinage continued to be current under the name of 'Hali' along with all other sorts of earlier rupees termed as 'chalanies' till about 40 years ago when Mir Mahboobalikhan the then ruler issued orders to stop the circulation of all other coins in his State except the 'Hali' issued by his predecessor since 1275 and caused them to be melted. This was enforced very rigidly by penalizing the possession and use of the old coinage in ordinary transactions. This caused a total abolition of the Chalani rupees which were still in use with a decreased value. In 1312 the machine made coins were introduced by Mir Mahboobalikhan which were equal to the current rupee in size and weight. This new Hali rupee threw even the old Hali rupees into the background. (Hali literally means current and so does the word chalani.) The mint was placed under the management of an English officer who systematized the whole currency on the lines of the coinage of the crown. Coins of various fractions of a rupee were also issued from the machines of the mint. The legend on these coins remained the same as on the old Hali rupees with the difference of regnal and Hijri years which changed from year to year.

In 1322 another change in the coinage followed which brought the coinage almost to the level of our current British Currency and is still current in that State. The gold and silver coinage has the drawing of Chahar minar—a central edifice with four towers in the city of Hyderabad, with the initial letter م in the arch of the building to indicate the name of the ruler Mir Mahboobalikhan. At the top of this design the words *أصف جاہ* to the right and *بہادر* to the left in the Arabic characters with the Hijri date at the bottom is seen on the obverse. The reverse of this rupee bears *یک روپیہ* in a small circle in the centre with *جلوس میمنت مانوس ضرب فرخندہ بنیاد حیدرآباد* running around.

The half rupee, quarter rupee and one-eighth rupee coins bear the same legend on them except the value of the coin mentioned on the respective issues.

Modern copper coins bear the same legend on the reverse but the obverse presents a monogram like that of the Turkish or the Egyptian coins, which has the same legend as above beautifully interwoven in it. Half anna and two pies coins of copper were issued during the reign of Mir Mahboobalikhan. The present ruler has introduced pies of copper also.

The rupees of the present ruler bear the same legend on all the coins of the aforesaid denominations except the initial letter ع standing for his name Mir Usmanali Khan in place of the old م of his father and the Hijri year which is changed on the coins from year to year.

He has also introduced a nickel one anna piece and currency notes of different denominations with the Persian legend on the lines of and similar to the British Indian Currency notes.

With this brief survey of the Coinage of the Nizams of Hyderabad I look forward for a detailed study of the same in future, and close for the present with the following description of some of typical coins illustrated in this issue :—

AV. 1. A gold coin of Mir Mahboob Ali Khan (1285–1330 A.H.)  
It reads :—

<i>Obverse.</i>	<i>Reverse.</i>
۹۲	جلوس ۱۵
آصف جاہ	میمنت
نظام الملک بہادر	مانوس
۱۲۹۹	فرخندہ بنیاد
	ضرب

- AV. 2. *Obverse* :—Same as No. 1 but date 1311 A.H.  
*Reverse* :—Same as No. 1 but the mint name Hyderabad and Farkhundabunyah, differently arranged.
- AV. 3. Machine made coin of the latest variety introduced in 1322 A.H. by Mir Mahboob Ali Khan. The coin is called half Ashrafi.  
*Obverse* :—The edifice of Chahar minar in centre with the following inscription in Naskh characters :—

نظام الملك	to the right,
آصف جاه	at the top,
بهادر	to the left,
۱۳۲۸	
سنه	at the base of the edifice, and
م	in the centre.

*Reverse* :—The value of the coin نصف اشرفى in the smaller circle in the centre with the same legend as on the reverse of No. 1 running round the same with the Regnal Year.

- AR. 4. This is a silver coin issued by Sikandarjah in the name of the Mughal Emperor Akbar II with the initial letter س on بادشاه of شا .

<i>Obverse.</i>	<i>Reverse.</i>
محمد اکبر شا (ه)	۲۵
(ع) —————	جلوس
س	(میه) —————
(با) دشاہ ۱۲۳۳ غا (ز)	فرخنده بنیا (د)

- AR. 5. This is a coin issued by Nasiruddaulah in the name of the Mughal Emperor Bahadur II with the initial letter ن over بادشاه of شا .

<i>Obverse.</i>	<i>Reverse.</i>
محمد بہادر شا (ه)	۱۸
ن	جلوس
۱۲۷۳ غا (زی)	میمنہ —————
	س فرخنده بنیا (د)

- AR. 6. This is a coin issued by Afzaluddaulah in the name of the Mughal Emperor Bahadur II with the initial letter ا over بادشاه of بادشاه .

*Obverse* :—Same as No. 5 except the date 1274 and the letter ا .

*Reverse* :—The same as No. 5.

- AR. 7. The Post Mutiny type of coin introduced by the Nizam after 1275 A.H. wherein the Mughal Emperor's name has disappeared. The legend reads :—

<i>Obverse.</i>	<i>Reverse.</i>
۹۲	جلوس
آصف جاہ	میمنت مانوس
نظام الملک بہادر	حدر اناد
۱۲۷۶	ضر
سنہ	فرخندہ بنیاد

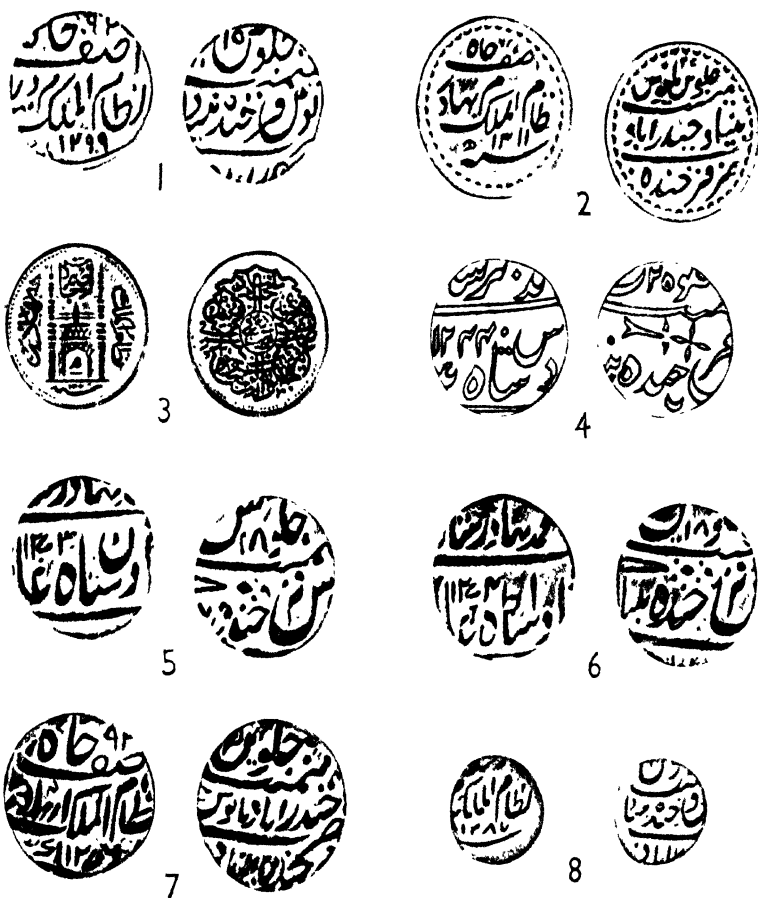
- AR. 8. A quarter rupee piece of Mir Mahboob Ali Khan, dated 1287. The legend on both the sides is the same as above.
- AR. 9. A half rupee coin of the above ruler with the date 1307. The legend remains the same.
- AR. 10. A one-eighth rupee piece of the above ruler, dated 1308 with the same legend.
- AR. 11. The first machine made rupee introduced by Mir Mahboob Ali Khan (now known as the old Hali while the old hand made issues were termed Chalani). The legend on the coin is the same as on the old rupees except the change of the year 28 and the Hijri, date 1312.
- AR. 12. The new Hali rupee introduced in 1322 A.H. with the initial letter م in the arch of the edifice on the obverse and the value یک روپہ inserted in the centre on the reverse.  
The arrangement of the legend is the same as on AV. 3 above.
- AR. 13. A quarter rupee piece of the latest type bearing the value چہار آنہ on the reverse. Legend is the same as above.
- AE. 14. This is an old dumpy copper pice evidently issued after the Mutiny. Such coins were current till recently.

- Æ. 15. The current pice of which six go for an anna. The value در پانی is mentioned on the reverse, the remaining legend being the same as above. The obverse shows a monogram in which the above legend and the initial letter م are artistically interwoven.

R. G. GRANI.





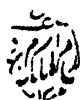


COINAGE OF THE NIZAMS.





9



10



11



13



14



12



15



COINAGE OF THE NIZAMS.



### 337. THE COINS OF NADIR SHAH AND THE DURRANI DYNASTY.

It must be admitted that a Coin Catalogue is out of date as soon as it appears; this is the fate of any work, however comprehensive, on a progressive subject because knowledge does not stand still. In fact success may be measured by the speed with which a work brings about its own supersession by stimulating further interest and discovery. A Coin Catalogue is usually not in sufficient demand to justify the issue of a second edition. My Catalogue of the Coins of Nadir Shah and the Durrani Dynasty appeared in March, 1934, and I can already add a number of items, usually differing only in date from those listed. Suggestions and emendations have appeared in the reviews. But the chief ground for writing this note is my desire to give some account of the large and important Durrani section of the Cabinet of the American Numismatic Society at New York. The information has been kindly supplied by the Curator, Mr. Howland Wood. I have also received some new coin material from that indefatigable collector, Mr. P. Thorburn; it is remarkable what can be obtained in London.

There are 340 Durrani coins in the Museum of the American Numismatic Society, New York, 16 AV., 205 AR., and 119 AE., an extensive and representative lot, very strong in the copper issues. Mahmūd Shah is represented by 62 silver coins. Some pieces worthy of notice are as follows:—

*Nādir*. As 21 but date 1152 : a fine specimen of 59.

*Aḥmad*. Like 126 but date 1163 : AR. Derajat 1181 : AE. Bhakhar 1162, 3.

*Taimūr as Nizam*. AV. Multan 1178, 8 ; AR. Lāhor 1172, 1.

*Taimūr*. AR. Ahmad Shahi 1195, 9 : AR. Bhakhar 1205 : AR. Kabul 1193, 6 : AR. Kashmir 1203, 16 and 1207, 20 : AE. Bhakhar 1196 : AE. Kashmir 1200, 13 : AE. Multan 1205, 20.

*Zamān*. AR. Double rupee like 753 : AR. Pashawar 1207, 2 : AE. Kashmir 1211.

*Shuja*. Second reign AV. Kābul 1224, 4.

AR. Bahawalpūr 1220, 1 : AR. Bhakhar 1219 and 1221 : like 1031 with date 1219 : AE. Bhakhar 1218 and 1222.

*Qaisar*. AR. Kashmir 1223, 1.

*Mahmūd*. Second reign : AV. and AR. Kabul —, 1 : AR. Bhakhar 1250, 1254, 1262, 1266, 1268.

*Aiyūb*. AR. Kashmir 1233, 1 : AE. Pashawar 1234.

*Kamran*. AR. Hirat 1254.

*Shuja*. Third reign AR. Ahmad Shahi 1255 (half rupee).

From the Philip Thorburn Cabinet I am allowed to mention the following pieces :—

*Nadir.* As 50 but 1151.

*Ahmad.* As 257 but date ۸ on reverse : as 264 but dated 4 : as 277 but 1.0 inches. I may remark that Sir Richard Burn also possesses a specimen of 277 on which the word خام appears to be replaced by نیم.

*Taimur.* AE. Dera.

*Obverse.*

119x تیمور شاه

—————

بادشاه در . . .

*Reverse.*

فلوس

ضر —————

دیره

*Zaman.* AR. Bakhar but 1213 : AR. Pashawar 1299, 2 like 762 but reverse arranged like Pl. XI, 13.

*Mahmūd.* The reverse legend of 919 (half rupee) is

هرات

————— صر

۱۲۳۵

*Mahmud.* First reign. Like 949 but ۱۲۱۷ at top of reverse : 964 but one eighth rupee : like 1148 but date ۱۲۱۶ or ۱۲۱۷ on obverse.

*Shuja.* Second reign.

*Obverse.*

In central foliated area

شاه

الملك

شجاع

*Reverse.*

مانوس

میمنه —————

جلوس

۱۲۱۹

بهکسر

ضر —————

Rest of couplet as on 995 round it.  
This rupee belongs to a new type.

*Mahmud*. Second reign. Like 949 but ۱۷۷۹ on reverse :  
AE. of *Khitta* Kashmir.

*Kamran*. Like 1207 but date 1248.

*Shuja*. Third reign. It has been pointed out that coin  
1224 is of date 1255 and not 1259 : I accept this  
correction.

*Fath Jang*. Mr. Thorburn has a rupee with obverse of  
1226 and reverse of 1229.

Also *Nadir Shah*. AV. Quarter Mohur of Qandahar. no  
date (Oxford).

AE. Sind, dated 1160. N.S. XLV, p. 106.

*Additions and Corrections.*—

The best account of the battle of Panipat between Ahmad  
Shah Durrani and the Mahrattas appeared in *Asiatick Researches*,  
Vol. 3, 1792, pp. 91 f. It is called *An Account of the Battle of  
Panipat and of all the events leading to it*: originally written in  
Persian by Cási Raja Pandit who was an eye witness of the  
Battle. I recommend the perusal of this curious and interesting  
story.

- p. viii. Two and a half days' maintenance of the  
whole world—see Mrs. Beveridge's *Babur Namah*  
p. xiv, Transpose 127 and 103.
- p. xxviii. In last line of Footnote, for 184 read 1834.
- p. xxxi. Line 33. For 'Babatih', read 'Bhatiya'—  
see Elliot and Dowson, Vol. II, p. 28.
- p. xxxiii. After Qandahar on line 26, insert Nadirabad.
- p. xxxv. Line 31. For 'except Hirat', read 'except  
Hirat and Haiderabad (Sind)'. If Haiderabad was  
not founded till 1182 A.H., the Sind half mohur of  
Muhammad Shah—*P.M. Cat.*, Vol. II, p. 320—must  
have been struck elsewhere.
- p. 157. First line of couplet. For, 'on gold and silver',  
read 'in gold and silver'.
- p. 187. I deciphered the coin of Shahpur Shah at the  
last moment when the rest of the Catalogue had  
been printed off. Hence the name of this brother of  
Fath Jang should be inserted in the Genealogical  
Table on p. xvii, also after Fath Jang in the list at  
the head of p. lvii, and the concluding paragraph on  
p. lix.

I have been criticized for omitting the Durrani Mint Mashhad  
(Meshed). The first sentence of the Preface states that the  
Catalogue describes the money of Nadir Shah and the Durrani  
Dynasty struck at mints in Afghanistan and India, and I adhered  
to that intention. However, Persian mints are included on  
p. xxxv for the sake of completeness ; the correct form Mashhad  
is given both there and on the Map. The name is not pro-



nounced Meshed in India ; I am writing from the Indian and not the Persian point of view. As regards Ibn Batuta (p. lxix), this form has become familiar and the correct transliteration looks to me pedantic. On the other hand I must write Hirat and Pashawar because the mints appear in this way on the coins.

I much appreciated the competent and constructive criticism of Mr. S. H. Hodivala in his review of my book—*Numismatic Supplement. XLV, J.A.S.B.*, May, 1935. In this place I will only mention the tentative couplet of Mahmud's second reign, pp. 157, 190. I anticipated, in fact called for criticism, and I read with much interest Mr. Hodivala's well informed and able remarks on pp. 103 and 104 of his review ; these conclude with the words ' the best course seems to be to suspend judgment until the discovery of clearer specimens '. After my struggles with this legend, perhaps I feel a little glad that even Mr. Hodivala has found the problem difficult. May I say that the much discussed word appears quite clearly at Plate XIII, 1 and 3. I await the correct solution.

R. B. WHITEHEAD.

### 338. NOTE ON A UNIQUE COPPER COIN OF BARBAK SHAH.

During our tour to Gaur, the ancient capital of Bengal, in Malda District in March, 1934, two copper coins encrusted with verdigris were handed over to me by Mr. N. G. Majumdar, M.A., Superintendent, Archaeological Survey of India. One of the two pieces, when cleaned and deciphered, turned out to be a common type of Husain Shah of Jaunpur, bearing the date H. 872, and the other a rare specimen belonging to Barbak Shah, the 7th Sultan in the line of Iliyas Shah of Bengal. The former was found at a place called Lalbazar in the vicinity of the Gunamant mosque at Gaur, while the latter piece was discovered on the surface of a cultivated field at a short distance to the south of the Dakhil Darwaza. The second coin is the subject matter of this note, and is of unusual interest, being the only known specimen of a copper coin of the Bengal Sultans, after the one mentioned by Mr. Nelson Wright in his Catalogue of the Coins in the Indian Museum, Vol. II, Pt. II, pp. 142-43.

It is a common belief that the Sultans of Bengal did not strike any copper issue and that their currency consisted mainly of silver coins with a few gold pieces. H. Blockmann who made an extensive study of this period says, 'The real commerce of the country was carried on in cowries as *no copper was issued*'.<sup>1</sup> Stanley Lane-Poole also shares the same view and emphatically asserts, 'The Coinage of Bengal, which is of silver, with a few gold pieces, but *no copper*'.<sup>2</sup> Mr. Nelson Wright, however, admits the existence of one copper coin issued by some Bengal Sultan and remarks, '*Only one copper coin exists, and that of doubtful authenticity*'.<sup>3</sup> He does not give any detail of this doubtful copper piece. The discovery of the present specimen upsets the above theory and shows that the copper currency was issued by the Bengal Sultans, although on a modest scale, as the demand for it was strictly limited to cowrie shells in the common transaction of business. Mr. K. N. Dikshit, Deputy Director General of Archaeology also holds a similar opinion regarding the paucity of copper currency in the Pala period of Bengal's history, chiefly on the strength of his discovery of a few copper coins and several jars full of cowrie shells, from the Paharpur site. The scarcity of copper coins issued by the Sultans of Bengal may further be explained by the supposition that they may have ordered to strike a small number of copper

<sup>1</sup> *J.A.S.B.*, Vol. XLIV, Pt. I, 1875, p. 288.

<sup>2</sup> *B.M.C.*, *Muhammadan States*, p. xxxvii.

<sup>3</sup> *I.M.C.*, Vol. II, Pt. II, pp. 142-43.

coins as an experimental measure but finding them unpopular for small transactions stopped further issues in this metal.

On the obverse side the coin has the Arabic legend :—

ابو المجاهد باريكشاه سلطان بن محمود شاه السلطان \*

(Abul Mujāhid Barbak Shah, the Sultan, son of Mahmud Shah, the Sultan), and on the reverse : *خليفة الله بالحق و البرهان*. (The viceregent of God with deed and proof.) This sonorous formula as a title was first introduced in his coins by Jalal-uddin Muhammad Shah,<sup>1</sup> the zealous convert Muslim potentate of Bengal (A.D. 1414–1431) and was subsequently followed by his successors on their coins and mural records.

The specimen is well executed and is in an excellent state of preservation. It weighs 76·3 grains, though not conforming to the standard weight of silver issues ranging from 160 to 168 grains, is apparently based on the metrology of the copper issues of Husain Shah of Jaunpur, whose territory was in close proximity to Bengal and whose coins are frequently met with in Gaur and the neighbouring districts.

SHAMSUDDIN AHMED.

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<sup>1</sup> *J.A.S.B.*, Vol. XLIII, Pt. 1, 1874, p. 294.

### 339. UNPUBLISHED MINT MARKS ON AWADH COINS.

The immediate predecessors of the regular Awadh coins are the *Ṣūba* Awadh coins which differ subsequently from the *Muḥammadābād*-Banares issues of the 26th regnal year of *Shāh 'Ālam II*. The arrangement of the obverse legend, the mint marks and the style of the fish on the reverse is quite different.

Beginning with the issues of *Ghāziū d-dīn Haider* the first king of Awadh, we have five couplets on the obverse and the 'Arms of Awadh' in various artistic styles on the reverse. The mint town has several honorific titles and the coinage on the whole is a finished example, based on the standard of the *Mughals*.

While classifying this series in the Provincial Museum Cabinet at Lucknow, I noticed that the mint marks on some of these coins did not tally with those on the Awadh coins of the Indian Museum, Calcutta included in the 4th volume of the Catalogue of Coins in that Museum. I was, therefore, tempted to examine the collection more closely and revise the 'Table of Mint Marks'. I have thus been able to add eight new mint marks bringing the total to 43. I may add however that most of these appear on the issues of the East India Company struck for circulation in Awadh in the name of *Shāh 'Ālam II*. Out of the 35 marks published so far, as many as 9 appear on the obverse and 10 on the reverse of *Muḥammadābād*-Banares series, whereas only 2 appear on the obverse and 4 on the reverse of the *Ṣūba* Awadh issues.

But if we strictly confine ourselves to the regular coinage of the Awadh kings from *Ghāziū-d dīn Haider* in 1818 down to *Wājid 'Alī Shāh* in 1856 A.D., it is strikingly clear that the number of mint marks dwindled down to a very insignificant figure. A detailed examination shows that *Ghāziū-d-dīn Haider's* coins have only 3 marks on the obverse and none on the reverse. *Nasīru d-dīn Haider's* have 2 for the obverse and none for the reverse. *Muḥammad 'Ālī Shāh*, however, seems to have been very fond of these marks and we find as many as 8 on the obverse and one on the reverse. As against this, the succeeding king, *Amjad 'Ālī Shāh*, has no mint marks at all. The last king, *Wājid 'Ālī Shāh* used only one mint mark on the obverse.

With the additions now made, King *Ghāziū-d-dīn Haider* has 8, *Nasīru-d-dīn Haider* 2, *Muḥammad 'Ālī Shāh* 10, and *Wājid 'Ālī Shāh* 2. The coinage of *Amjad 'Ālī Shāh* is conspicuous by the absence of any mint mark. But the most important point is that excepting *Muḥammad 'Ālī Shāh* who has only one mint mark on the reverse, the Awadh kings had no such marks on the reverse of their coins. The significance of these marks, however, is still shrouded in mystery and forms a fascinating subject for study.

PRAYAG DAYAL.



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25 	26 	27 	28 	29 	30 
31 	32 	33 	34 	35 	36 
37 	38 	39 	40 	41 	42 
43 					



*Published Mint Marks*



*Un-published*

TABLE OF MINT-MARKS.



### 340. THE COUNTESS AMHERST COLLECTION OF ASSAMESE COINS.

In the latter half of July, 1934, among notifications in the daily papers of sales by Sotheby & Co., the well-known London auctioneers, mention was made of the inclusion in a sale of coins, to be held on July 30th, of the 'Countess Amherst Collection of Assamese coins'. Enquiry as to the names of Kings in whose names these coins were struck and the contemporary MS. catalogue that was stated to be included, elicited a list of some 70 coins. Of these 12 were gold: and a cursory perusal of the list showed that a large proportion of the coins were not to be found in the Shillong Cabinet. The importance of this collection lay in the fact that it had apparently been made at the instance of the 1st Earl Amherst who was Governor-General of India from 1823-28: it was in his time that the first Burmese War occurred which ended with the signing of the Treaty of Yandabo in 1826, and the transfer of Assam to the British. There was no time to consult the local authorities in Assam as to whether they would like any bid to be made on their behalf, but as I had to be in London the following week to represent the University of Calcutta at the first Ethnographical and Anthropological Congress, I determined to be present, if possible, at the sale. Two dealers quickly ran the lot up to £22, and when they seemed unwilling to advance any further, I offered an additional 10/- and finally secured the collection for £24.

The accompanying 'Description of Assamese Coins by Dr. Wilson, Calcutta, 1828' seems to have been drawn up at the request of Earl Amherst for his Countess' information just before he returned to England, and—as is shown by the signature at the end of the catalogue—it was prepared by Dr. Horace Hayman Wilson, Secretary of the Asiatic Society of Bengal from 1811-1833. Dr. Wilson's introductory note may be left to speak for itself:—

The condition of Asam from the most remote to the most recent periods is known to us only by a few scattered notices in the mythological or poetical writings of the Hindus to which reference has been occasionally made by Sanskrit Scholars, by accounts of its invasion in the reign of the Musselman Princes of India of which translations have appeared in various periodical collections, and by a brief history derived from original sources by Dr. Buchanan and printed in a Volume published in England under the title of *Annals of Oriental Literature*. The Asiatic Society of Bengal is also possessed of a Manuscript History of Asam from original documents, but too crude and insuffi-



ciently authenticated for present publication. To these sources of information therefore the Coins in the possession of the Countess Amherst form an important accession.

From the Hindu writings it appears that at least the western portion of Asam was at an early period Hindu, and the same may be inferred from the names of the main stream, the *Lohit* and *Brahmaputra*, which are Sanskrit terms, implying the Red River, and the son of Brahma, a character the River is fabled to possess. At a comparatively modern date, about the end of the 11th Century, a new people appear to have invaded the Country from the East, and given to it the dynasty and the constitution which existed some time before its occupation by the Burmese which partly led to the late war with Ava. The manuscript states that the Princes and their chief followers came down from heaven, in memory of which event the Rajas of Asam uniformly take the title of *Sverga Deva*, Lord of Paradise or heaven. Buchanan conjectures this might be part of Tibet, and it is evident from the names of the two first Princes *Khun leng* and *Khun lai* as well as the first Rajas of Asam proper, *Sooka-pha*, and his successors *Sootoo-pha*, *Sooben-pha*, and others, that these persons were originally from some of the Indo-Chinese tribes. The first five Coins clear up this difficulty, if the impressions they bear are accurately described as written in the *Shaum* characters, or in that of the people of *Laos*.<sup>1</sup> There are no means of verifying this fact in Calcutta, but there is no reason to question the correctness of information procured upon the spot by so intelligent and enquiring an officer as Captain Neufville. We are therefore authorized to conclude that Asam was subjected to a new form of Government, a

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<sup>1</sup> From a copy of the Laos Alphabet, kindly supplied by Sir Denison Ross, it seemed doubtful whether this statement of Dr. Wilson was altogether correct, especially in view of the fact that Laos is so far away from Assam (on the northern borders of Siam and French Indo-China, on both sides of the big bend of the Mekong, S.W. of Luang Prabang).

It was then found on reference to Rai Sahib Golap Chandra Borua's *Ahom-Assamese-English-Dictionary* (Calcutta, 1920, Preface, p. ii) that 'Ahom belongs to the same sub-group of the Tāi language as Khāmṭi and Shān. Its alphabet 'is related to those of Khāmṭi, Shān and Burmese but it possesses signs for *g*, *gh*, *j*, *jh*, *d*, *dh*, *b*, and *bh*, which are wanting in Khāmṭi and Shān'. The Rai Sahib further notes (*idem*, p. i) that the Ahoms called themselves *Tāi* (Celestials) 'by which name the Shāns still designate themselves, and they maintained a fairly continuous intercourse with the inhabitants of the original home until very recent times.'

There seems, however, to be actually some foundation for Dr. Wilson's statement as in the *Encyclopædia Britannica* article on Shāns, it is stated that 'the Thāi language may be divided into two sub-groups, the North and the South. The South includes Siamese, Lao, Lū, and Hkūn, the North the three forms of Shān, namely North Burmese Shān, South Burmese Shān, and Chinese Shān with Hkāmṭi and Āhōm.'

new race of Princes and a new religion imported from Laos, towards the close of the Eleventh Century. The return of the Princes to the Hindu faith as latterly professed is shewn by the Coins.'

The Capt. Neufville referred to in Dr. Wilson's note had in 1828 just been appointed Assistant for Upper Assam to David Scott, the Agent to the Governor-General for North Eastern India. Capt. Neufville—as noted in Gait's History of Assam—had distinguished himself as Intelligence Officer in the late Burmese War, and, in addition to his political work, was also Commandant of the Assam Light Infantry. It is certain that a man in Capt. Neufville's position would have every facility of making a good collection of the local currency, if he so desired, and from the mention of his name by Dr. Wilson, it seems possible that the collection now to be described was actually made by Capt. Neufville for presentation to the wife of his Governor-General, who had, only two years previously, on the successful conclusion of the Burmese War, been advanced to the rank of Earl Amherst of Arakan.

The collection was found to consist actually of 12 Gold coins and 72 Silver coins, all with three exceptions—a Kuch-Bihār  $\frac{1}{2}$ -Rupee, a small gold coin from the Yemen, and a French East India Company's 2-anna piece—Assamese coins: and comparison with Dr. Wilson's list showed only the following discrepancies:—

1. The collection now includes a Rupee of Śiva Simha, dated 1638 *Śāke*.
2. On the other hand a Rupee of Rājeśvara Simha, dated 1670 *Ś.* is missing.
3. The  $\frac{1}{16}$ -Rupee of Gaurinātha Simha listed by Dr. Wilson was not found. Instead, however, the following was found:—
4.  $\frac{1}{16}$ -Rupee of Brajanātha Simha (which suggests that Gaurinātha was misread for Brajanātha).
5. A  $\frac{1}{16}$ -Rupee of Chandra Kānta Simha is not listed.
6. The  $\frac{1}{2}$ -Rupee of a Koch King is also not mentioned; as is also the case with:—
7. The  $\frac{1}{8}$ -Dinār of the Imām Al-Māhdi of Ṣan'ā', Yemen.

Finally:—

- 8–10. Three unlisted Gold coins of Gaurinātha (viz.  $\frac{1}{2}$ -Mohur,  $\frac{1}{8}$ -Mohur and  $\frac{1}{32}$ -Mohur) were also found in the Collection.


No. 1 may have been exchanged with some one for No. 2, but the presence of Nos. 5–10 show that a few additional coins were added to the Countess' collection, after Dr. Wilson was given the opportunity of describing the coins found in it in 1828.

The following is an analysis of the Collection as it stood when purchased—a X being added in the case of those coins that are not mentioned in Mr. A. W. Botham's 1930 (2nd) edition of the 'Catalogue of the Provincial Coin Cabinet, Assam'. The dates mentioned being in the *Śāka* era, 78 has to be added in each case to bring them to the corresponding date in the Christian era :—

Name of King.	Gold.	Silver.
Chakradhvaja Siṃha	...	1 (Re. 1585 S.=1663 A.D.).
Gadādhara Siṃha ..	....	5 (Rs. Ahom script, dated <i>Raisūn</i> = 1681 S.) XX.
Rudra Siṃha ..	1 (Mohur : 1620 S.) X	2 (Rs. 1623 and 1635).
Śiva Siṃha ..	....	2 (Rs. 1637 and 1638).
Śiva Siṃha and Queen Phuleśvarī.	....	1 (Re. 1646) X.
Śiva Siṃha and Queen Ambikā.	1 (Mohur of 1657 and Regnal Year 22) X.	2 (Rs. 1654, R.Y. 19, and 1657, R.Y. 21).
Śiva Siṃha and Sarveśvarī.	....	1 ( $\frac{1}{2}$ -Re. R.Y. 24) X.
Pramatta Siṃha ..	....	2 ( $\frac{1}{4}$ -Rs. R.Y.'s 23 and 24. No <i>Nāka</i> date) XX.
Rājeśvara Siṃha .	1 (Mohur, 1688) X	1 (Re. of 1664 and R.Y. 29) X.
		2 (Rs. 1670 X and 1672).
		2 ( $\frac{1}{2}$ -Rs. undated).
		2 ( $\frac{1}{4}$ -Rs. both 1670).
		4 (Rs. : 2 in Devanāgarī script of 1675, 1 in Persian script of 1685, and 1 of 1686).
		2 ( $\frac{1}{2}$ -Rs. undated, one in Devanāgarī script) XX.
Lakṣmī Siṃha ..	2 (Mohur, 1701 X : $\frac{1}{4}$ -M. 1697 X).	1 ( $\frac{1}{4}$ -Re. of 1689) X.
		2 (Rs. 1696 and 1700 X).
		2 ( $\frac{1}{4}$ -Rs. undated) X.
		2 ( $\frac{1}{4}$ -Rs. 1699 and 1701) X.
Gaurīnātha Siṃha ..	4 (Mohur 1716, R.Y. 1 X (?) : $\frac{1}{2}$ -M. undated X : $\frac{1}{4}$ -M. „ X : $\frac{1}{32}$ -M. „ X).	2 (Rs. 1705 : and 1716 X (?)).
		2 ( $\frac{1}{4}$ -Rs. both 1716 but one with R.Y. 1 under date) XX.
		2 ( $\frac{1}{16}$ -Re. undated) XX.
Bharatha Siṃha ..	....	2 ( $\frac{1}{2}$ -Rs. undated) X.
		2 ( $\frac{1}{2}$ -Rs. 1714, 1719) XX.
Sarvānanda Siṃha ..	....	2 (Rs. both 1716) X.
		1 ( $\frac{1}{2}$ -Re. undated) X.

Name of King.	Gold.	Silver.
Kamaleśvara Siṃha .. Chandrakānta Siṃha	1 ( $\frac{1}{8}$ -M. undated) X ....	2 ( $\frac{1}{2}$ -Rs. undated) X. 2 (Rs. both 1741) X. 2 ( $\frac{1}{2}$ -Rs. undated) X. 2 ( $\frac{1}{4}$ -Rs. 1741, 1742) XX. 1 ( $\frac{1}{32}$ -Re. undated) X.
Brajanātha Siṃha ..	1 ( $\frac{1}{2}$ -M. undated) X..	2 (Rs. both 1740) XX. 2 ( $\frac{1}{2}$ -Rs. undated) XX. 2 ( $\frac{1}{4}$ -Rs. 1739, 1740) XX. 1 ( $\frac{1}{10}$ -Re. undated).
Jogeśvara Siṃha ..	....	2 ( $\frac{1}{2}$ -Rs. undated). 2 ( $\frac{1}{4}$ -Rs. both 1743) XX.
Total Assamese Coins	11 : 10—or possibly all 11—not in Shillong Cabinet.	70 (37 or possibly 38 new).
Rājendra Nārāyaṇ (of Kuch-Bihār). French E.I. Coy. .. Al-Māhdi, Imām of Ṣan'ā', Yemen.	... .... 1 ( $\frac{1}{8}$ -Dinār) ..	1 ( $\frac{1}{2}$ -Re. undated). 1 ( $\frac{1}{8}$ -Re. „ ) ....
Grand Total ..	12 Gold ..	72 Silver.

Efforts were also made, after the Amherst collection had been catalogued, to increase still further (by exchange, gift, or, in one case, by purchase) the number of coins not previously included in the Shillong Cabinet, with the result that the following additional coins have now been added :—

1. Jayadhva Siṃha .. Re. of 1570 S'. (Slight variation of previous Shillong specimen).
2. Rudra .. Re. of 1624.
3. Śiva Siṃha and Ambikā.. Re. of 1657 R.Y. 21. (Slight variation of previous Shillong specimen.)
4. Gaurinātha Siṃha .. Re. of 171(8?).
5. „ .. Re. of *Śake* 120 (*sic.*!).
6. „ ..  $\frac{1}{2}$ -Re. of R.Y. 7.
7. „ ..  $\frac{1}{2}$ -Re. Mint Mark  (*Disai*). (Slight variation of previous Shillong specimen.)
8. Bharatha .. Re. of 1715.
9. Brajanātha .. Mohur of 1739.
10. Rājadhara Mānikya Deva Re. of 1707 S'. (= 1785 A.D.).  
of Tipperah.
11. Chaurajit Siṃha of Manipur Re. of 1734 S'. (= 1812 A.D.).

Nos. 1, 8 and 10 were obtained by the generous co-operation of Mr. J. Allan, Keeper of Coins and Medals, British Museum.

*Details of the coins now in the Collection that have not hitherto found a place in the Shillong Catalogue.*

SUPĀTPHĀ *alias* GADĀDHARA SĪMHA.

(1603–1618 *Śāka*=1681–1696 A.D.)

Striking of fresh coinage with each New Year did not start in Assam till the accession of Gadādhara's son, Rudra Sīmha, in 1618 *Śāka* (=1696 A.D.), and all the 5 Gadādhara Rupees in Ahom script found in the Amherst collection are only variations of those struck by this King in his accession year *Raisān*, or the 33rd year of the 19th *tāosiñā* (cycle of 60 years current in Assam),<sup>1</sup> viz. 1603 *Śāka*. Except for trifling differences, three of them correspond to Nos. 1 and 4 in the Shillong Catalogue, but the other two are new, being distinguished by having no Dragon or Peacock on either face, nor, indeed, any other ornamentation, such as the segments and dots found on the Reverse of S.C. No. 2. Though their inscriptions are the same as those on other coins of Gadādhara, these two coins are struck from differently sized dies, and instead of the Reverse being, as in most Assamese coins of later Kings, at 180° to the Obverse, in the first it is struck without inverting the blank, while in the second the Reverse is struck at right angles to the Obverse.

Dr. Wilson was evidently unable to make anything of the inscriptions on these coins, and moreover was misled by someone as regards both their attribution and date, as may be gathered from what follows :—

‘These are the coins of the ancient Rajas, inscribed with characters not known in Calcutta. One is unappropriated. The other four are thus described :—

1 of Soobenpha—in the 13th Century.

1 of Sootoophā—,, ,, ,, ,,

1 of Soopatpha—,, ,, ,, ,,

1 of Soohompha—in the beginning of the 16th Century.’<sup>2</sup>

In his subsequent notes on the 1585 *Ś.* coin of Chakradhvaja Sīmha, Dr. Wilson draws a parallel between the meaning of the name of this King, viz. ‘He whose mark or symbol, or, if it may be so rendered, armorial bearing, is the Discus’, that

<sup>1</sup> Starting from 568 A.D., the reputed date of the descent from heaven of the two brothers Khunlung and Khunlai, the legendary first Ahom Kings. The change-over to *Śāka* era was probably due to Rudra Sīmha.

<sup>2</sup> Sukāphā, the tribal chief who led the Ahoms in 1228 A.D. over the Pātākāi Pass into what is now Assam, is said to have been succeeded in 1268 A.D. by his son Suteuphā, who in turn was followed 13 years later by his son Subinphā. Soohompha is presumably Sukhāmphā, who ruled from 1552 to 1603 A.D. and was the son of Sukleñmuñ, the first Ahom ruler to strike coins; while, as we have already seen, Supātpā, or Gadādhara Sīmha, did not come to the throne till 1681 A.D.

weapon being one of the distinguishing marks of the Hindu Deity Vishnu, and that of Gadādhara 'The Holder of the Mace', which is also an epithet of Vishnu. He adds: 'The manuscript, and Buchanan, refer the introduction of the Hindu faith to *Gadādhara Sīṅh* and do not mention the Prince whose coin is here noticed. Buchanan states also that no coin of *Gadādhara* was found by him'. Dr. Wilson could not make up his mind whether the two names referred to the same individual, or whether (as we now know to be the case) Chakradhvaja was one of Gadādhara's predecessors on the throne of Assam.

### RUDRA SĪMHA.

(1618–1636 *Śāka* = 1696–1714 A.D.)

As noted in a previous paper (*J.A.S.B.*, 1910. p. 632) no specimens of this King's Ahom coinage under his Ahom name SUKRUṆPHĀ ('The Awe-Inspiring Tiger of Heaven') which was presumably struck on his accession to the throne in 1618 *Ś.* have hitherto come to light, but coins in Sanskrit are known for this and every subsequent year of his reign down to 1636—the year in which he died. The Amherst collection fortunately included a specimen of the only Gold coin of this King that is known to have been struck, viz. of the year 1620 *Ś.*; and the series of Rupees in the Shillong Cabinet has since been further supplemented by a specimen of the very rare Rupee of 1624, of which previously only two other specimens were known to exist.

A distinct change in religious cult—from Vaishnavism to Saivism—is evident from the invocation of Hara and Gaurī on the Reverse of Rudra Sīmha's coins. The legends on the Mohur only differ from those on the Rupees of 1618 and 1620 in the *dra* of *Rudra* being transferred from the end of the 2nd line of the Obverse to the beginning of the 3rd, but the Dragon at the bottom of the Obverse also faces *left* instead of right. There is no other ornamentation on either face. This coin closely resembles that of the Mohur in the possession of Mr. Botham that was figured as No. 1, Pl. XXVII, of the writer's paper already referred to, but is a much better specimen.

### ŚIVA SĪMHA.

1. ŚIVA SĪMHA alone : 1636–46 *Śāka* : 1650 *Ś.* (?) : 1654 *Ś.* (R.Y. 18) and 1659–61 *Ś.* (R.Ys. 24 and 25).
2. ŚIVA SĪMHA with Queen PHULEŚVARI : 1646–50 *Ś.*
- 2a. ŚIVA SĪMHA with (the same Queen after she had changed her name to) PRAMATHEŚVARI : 1649–1653 *Ś.*
3. ŚIVA SĪMHA. with Queen AMBIKĀ : 1654 *Ś.* (R.Y. 19)—1659 *Ś.* (R.Y. 24).

4. ŚIVA SIMHA, with Queen SARVEŚVARI: 1661 Ś. (R.Y. 25)—1666 Ś. (R.Y. 31).

Total duration of reign: 1636–1666 Ś. = 1714–1744 A.D.

The previously unrecorded coins of this King from the Amherst Collection include the following specimens:—

With Queen PHULEŚVARI. A Rupee of 1646 (no R.Y.) that differs from S.C. No. 19 in having what is apparently intended to be a flower to the right of the *Ha* at the end of l.(1) of Reverse.

With Queen AMBIKĀ. Several novel coins struck by Śiva Simha jointly with this Queen have now been added to the Shillong collection. The principal one of these is a Mohur (from the Amherst Collection), dated 1658 (and R.Y. 22) which, however, seems to have been struck from the same die as S.C. No. 45—a rupee of the same year. A rupee of the previous year (and R.Y. 21) has also been secured by exchange. This differs from the Shillong specimen of the same date in having no ornamentation, except the Dragon to R. at bottom of Obverse, in which respect it follows the coins of 1654–6. Lastly, a  $\frac{1}{2}$ -Rupee and  $\frac{1}{4}$ -Rupee—each with R.Y. 24—not only have the distinction of being examples of the coinage struck in the last year of this Queen's life, but have ornamentation in the form of animals that differentiate them from other coins of the same Queen. The inscriptions on the  $\frac{1}{2}$ -rupee are found in S.C. No. 38, except for 24 (instead of 19) appearing as the R.Y. at the bottom of the Reverse. There is no ornamentation on the Reverse; but on the Obverse there is a Dragon (running to left but with head turned backwards) at the bottom, while a rosette of 7 dots appears below the Śi at the end of the first line. In the  $\frac{1}{4}$ -rupee the inscriptions are the same as in S.C. No. 39, except for the R.Y. being 24 instead of 19; but the ornamentation is different. On the Obverse we again find the rosette of 7 dots below the Śi (of Śiva) while on the Reverse, along side 6, i.e. to the right of the R.Y., a Deer is shown running upwards to the Right, but with head turned backwards. (For reproduction of these two coins, *vide* Pl. 5, Nos. 1 and 2.)

A discussion of the reasons why Śiva Simha alone among Assamese Kings permitted the names of his Queens to appear on the coinage will be found on pp. 634–5 of the writer's 1910 paper already referred to; but the following extract from Dr. Wilson's 'Description' deserves quotation, as Buchanan's evidence—even though it is second hand, being based on some Assamese chronicle—does not appear to have been previously utilized in dealing with the question:—

'Buchanan states that this [appearance of Queens' names on the coinage] arose from a plot to deprive the Prince of real power, and administer the Government through the agency of females. It was foretold soon after

his accession that his reign would be short, and that he would be deprived of all power before his death. To evade this prophecy it was suggested that the attribute of sovereignty should be transferred to his queens, several of whom were accordingly placed in succession upon the throne, to whom Śiva Siṅh yielded nominally his authority; the real authority being engrossed by his Ministers.'

#### RĀJEŚVARA SĪMHA.

(1673<sup>1</sup>–1691 Śāka=1751–1769 A.D.)

A third<sup>2</sup> specimen of a Mohur struck in 1688 was found among the Amherst coins and is a useful addition to the Shillong collection (which already had a Quarter-Mohur of the same year). The inscriptions are the same as in the rupee of 1688, and the ornamentation is also probably the same as in that coin. From the Mohur, however, it would appear that the 'indistinct dots' mentioned at the left of the Dragon at bottom of Obverse of the 1688 rupee are really another segment and 5 dots. Besides a variant of the ¼-Re. of 1689, there are also two undated half-rupees with different ornamentation from any of the other half-rupees at Shillong. One of these (figured as No. 3, Pl. 5) is in Devanāgarī script, which suggests that it possibly dates from 1675, the year in which Rājeśvara struck rupees in this script. (*vide* S.C. No. 6.)

#### LAKSHMI SĪMHA.

(1691<sup>3</sup>–1702 Śāka=1769–1780 A.D.)

A Mohur of 1701 Ś. and a ¼-M. of 1697—both previously unrecorded—were found among the Amherst coins. The former resembles the Rupee of 1700; while the latter only differs from the ¼-M. of 1692 (S.C. No. 2) in the date and in having a dot within the crescent above the Śāka on Reverse.

Other coins, not previously in the Shillong Cabinet, are a Rupee of 1700, which helps towards filling up a gap in the

<sup>1</sup> A Mohur in Ahom script was struck in this year. No coins of Rājeśvara later than 1690 are known.

<sup>2</sup> The two previously known are in the cabinets of the British Museum and Mr. Botham.

<sup>3</sup> Except possibly for the ¼-Re. with R.Y. 1 subsequently mentioned, no coins of 1691 Ś. struck in the name of Lakshmi Sīmha are known. This was probably due to a controversy as to who should succeed Rājeśvara (*vide*, *J.A.S.B.*, 1910, p. 637); and Lakshmi may not have been formally installed till the following year, after the defeat and death of a usurper called Rāma Kānta, who was proclaimed King by the rebel Moāmariās (Vaishnavas), and is said to have struck coins in 1691 Ś. From the absence of coins for Rājeśvara's last year, this rebellion may have begun even before the latter's death.



Shillong series of the later years of Lakshmi, and apparently resembles the Re. of 1698 (S.C. No. 21) ; and an undated  $\frac{1}{4}$ -Re., which resembles S.C. No. 1 in having no ornamentation on either side, but differs from it in not having a R.Y. 1 at the bottom of the Reverse. This may constitute the only known example of coinage in the first year of Lakshmi Simha's reign.

#### GAURINĀTHA SĪMHA.

(1702–1718 *Śāka*=1780–1796 A.D.)

The troubles with the Vaishnava Moāmariās that had occurred at the beginning of Lakshmi Simha's reign broke out again shortly after the accession to the throne of Assam of his son Gaurinātha, and after four years strife, Gaurinātha was compelled in 1708 *Ś.* to leave his capital at Rangpur and take refuge in Gauhati. A reflection of this trouble is shown by the almost complete cessation of Gaurinātha's coinage between 1709 and 1716, and the issue of coins in the name of Bharatha Simha, the Moāmariā leader, at Rangpur. At the end of 1792 A.D. (1714 *Ś.*) Gaurinātha had even to leave Gauhati, and sought refuge with Captain Welsh, the Commander of the British forces in Goālpārā. The latter had already received instructions from Lord Cornwallis, who was then Governor-General, to assist Gaurinātha in ejecting from Assam the Bengali and Hindustani mercenaries of Krishna Nārāyan, whose father—the Raja of Darrang—Gaurinātha had murdered, and after Gauhati was retaken, Capt. Welsh began to make arrangements for advancing still further into Upper Assam. In January, 1794 A.D., Gaurinātha also applied to the Governor-General for the permanent retention of British troops in Assam, offering to pay Rs. 3 lakhs annually for their maintenance : and when, in the course of the subsequent expedition, Rangpur was recaptured in the following March, and Gaurinātha re-installed as King, in token of his indebtedness to the British, he issued coins bearing the *Śāka* date 1716, and R.Y. 1.

A change in the post of Governor-General had however occurred in December, 1793—Sir John Shore taking the place of Lord Cornwallis : and, owing to the new Governor-General having decided on a policy of non-interference in affairs outside of British India, Capt. Welsh was ordered in the following April to stop all further offensive operations against Gaurinātha's enemies, the Moāmariās, and to withdraw his troops into British territory. This evacuation was completed by the first week in July, 1794. The immediate result was that the Moāmariās—who had been repeatedly defeated by Capt. Welsh's troops—again reoccupied Rangpur, while the effect on Gaurinātha of the withdrawal of the British is also indicated by the change in Regnal Year to 16 (instead of 2) on some of the coins struck in 1717 *Ś.* Chaos

again ruled in Assam for the following  $1\frac{1}{2}$  years, at the end of which time Gaurinātha died on December 15th, 1795. This date is confirmed by there being no authentic coins of later date than 1717 Ś.—a year which ended on April 9th, 1796.

As already noted, the Gold coins of Gaurinātha in the Amherst collection include a Mohur of 1716 (with R.Y. 1 at bottom of Reverse), an undated  $\frac{1}{2}$ -Mohur, a  $\frac{1}{8}$ -Mohur and a  $\frac{1}{12}$ -Mohur. The Mohur may be identical with S.C. No. 38 (if the latter has no ornamentation on Reverse). The  $\frac{1}{2}$ -Mohur has the same inscription as the  $\frac{1}{2}$ -Re. catalogued as S.C. No. 1, but with no R.Y. (or date) on Reverse. There is no ornamentation on either side. The inscription on the  $\frac{1}{8}$ -M. is the same as in the  $\frac{1}{8}$ -Rs. (S.C. Nos. 80-2). with a group of 3 dots at angle 8 and two other similar groups below the second line of Obverse. The Reverse is devoid of ornamentation. The  $\frac{1}{12}$ -M. has the same inscription as in S.C. No. 88, which has a group of 3 dots to the right—not left, as in the Amherst specimen—of the *Śrī* on Obverse.

The Rupees that are new to the Shillong Cabinet include the following :—

(1) Re. of 1716 and R.Y. 1, with inscription as in the Mohur already described. The Reverse differs in having a २ below the bottom line, as well as a group of 5 dots at angle 2, two groups of 3 dots each above the second *Śrī* and *Har* of *Hara* respectively, and a third group of 3 dots between the upper portions of the *Ha* and *ra* in the first line.

(2) A crudely-struck Re. of *Śāke* 171 (?? 8) (?? R.Y. 7) —*vide* Pl. 5, No. 4). Inscription as in Mohur, and all Rs. from 1707 onwards to end of reign, e.g. S.C. No. 18. Ornamentation :—

*Obverse.*

*Reverse.*

- |   |   |
|---|---|
| (a) Segment of 3 dots at side 2.  | Segment of 3 dots at beginning,                   |
| (b) Dragon at bottom degraded to two groups of 2 dots each and a tail under date to R., so that the Dragon seems to have faced L. | and inclined line of 3 dots at end of first line. |
| (c) To extreme L. of bottom (side 4) a triangular sign which may have been intended to represent the head of an Assamese 7.       |   |

It is difficult to make any useful comments on the date of this coin for—as has already been stated—Gaurinātha died several months before the close of *Śāka* 1717, and there is no sign of a 1 before the triangle that may have been intended for a 7 of the R.Y. On the other hand, it is clear that the other numerals were intended to indicate some year in the second decade of the 18th *Śāka* century. The coin was bought by Sir R. Burn at Ghāzīpur, U.P., and obtained from him by exchange.

(3) Crudely struck Re. with unusual arrangement of inscriptions and strange date (*vide* Pl. 5, No. 5).

*Obverse.*

- (1) *Śrī Śrī Svarga.*
- (2) *Deva Śrī Gaurī-*
- (3) *nātha Śimha nripa-*
- (4) *śya Śāke 120.*

Dragon to L. at bottom. Group of 5 (?) dots at angle 2, and (?) semicircle of 4 dots at angle 4—in front of Dragon.

*Reverse.*

- (1) *Śrī Śrī Hara*
- (2) *Gaurī charanāra.*
- (3) *binda makaranda ma-*
- (4) *dhu karasya.*

Apparently no ornamentation.

Suggestions as to the precise meaning of the date as shown on this coin are invited from students of Assamese history and numismatics. It cannot be intended as a date in a new era commencing from the accession of Gadādhara Śimha in 1603 Ś. as that would bring the date of the striking of the coin later than the death of Gaurinātha in 1717 Ś. The coin reached the writer from Jorhāt and was obtained from him by exchange.

In addition to the above-mentioned coins, two new  $\frac{1}{2}$ -Rs. were obtained by exchange; the two  $\frac{1}{4}$ -Rs. of 1716—one with R.Y. 1—in the Amherst collection are different from those already in the Shillong Cabinet; and the two  $\frac{1}{8}$ -Rs. found in the collection were also previously undescribed. For details the supplementary catalogue of these coins at Shillong may be consulted.

## BHARATHA ŚIMHA, Rājā of Rangpur.

(1713–1715 and 1718–19 Śāka=1791–3 and 1796–7 A.D.)

Bharatha was leader of the Moāmariās who drove Gaurinātha from his capital, Rangpur, in 1708 or 9 Ś. Coins struck by him in 1713 Ś. are rare, the only ones recorded up to now being a Rupee in the British Museum and a  $\frac{1}{4}$ -Re. in Mr. Botham's cabinet; and, previous to the purchase of the Amherst collection, the Shillong Cabinet did not possess a single coin struck by Bharatha Śimha during the period before Gaurinātha was reinstated by Capt. Welsh. The Amherst Collection was found to include a  $\frac{1}{4}$ -Re., dated 1714 Ś.; and a Rupee of 1715 Ś. was obtained by exchange with the British Museum. The latter only differs from S.C. No. 1 (a Re. of 1718 Ś.) in the date, and details of ornamentation; but no  $\frac{1}{4}$ -Re. of 1714 Ś. seems to have been previously noted, and the coin has therefore been reproduced on Pl. 5, (No. 6). Except for date, the inscription is the same as that of the  $\frac{1}{4}$ -Re. of 1715 Ś. in the British Museum, which was described by Allan on p. 328 of his 1909 paper in the 'Numismatic Chronicle' and illustrated as No. 8, Pl. XXV, of the same paper; but the ornamentation of the Reverse of the two coins is very different. In the Amherst specimen, this consists of segments of circles at sides 1, 3 and 7; a segment

and 4 dots at side 5 ; a knob-ended cross between the 7 and initial figure of the date ; and, finally, single dots over (1) the ₹ of *Śāka* ; (2) before the initial figure of the date ; (3) between the initial and second figures ; and (4) between the second and third figures. The last three form a triangle, with the broadest side uppermost. As regards the Obverse, the single dot at the beginning of the first line in the B.M. specimen is missing in the Amherst coin, so that its obverse is entirely devoid of ornamentation.

The Amherst Collection also included a  $\frac{1}{4}$ -Re. struck by Bharatha in 1719 Ś. which, like that of 1714, has not previously been recorded. The inscriptions are identical, but the ornamentation found on both sides differentiates the 1719 coin from those of either 1714 or 1715. On the obverse there are 2 dots at angle 2 and 3, in a convex line, at angle 7, i.e. at the beginning and end of the first line. The Reverse has a segment and 5 dots at side 1 ; a group of 4 dots at side 3 ; and groups of 3 dots at angles 2 and 6, and sides 2, 4, 5 and 8.

Of the two  $\frac{1}{2}$ -Rs. found in the Collection, one is identical with S.C. No. 3, and has no ornamentation on either side ; while the other differs in having on the Obverse a group of 3 dots at the beginning and end of the first line (i.e. angles 2 and 7) as well as one at angle 3 ; and between the second and third lines there is a row of well-separated single dots. On the Reverse, a group of 3 dots is found at angle 2, and a single dot below the second *pa* of 1.2. The reverse is twisted left by one sector ( $45^\circ$ ) from the usual position of  $180^\circ$  to the Obverse.

Dr. Wilson makes the following remarks at the end of his description of Bharatha Simha's coins :—

'This was the first Prince set up by the followers of the Mahamari,<sup>1</sup> and the Legend on his coins explains the nature of the disputes that agitated Asam. It was a religious contest, between the worshippers of Śiva and Vishnu. The ruling dynasty was all along attached to the former, but in the coins of Bharata and Sarvananda, the name of Krishna is substituted for those of Hara and Gauri. Bharata was reduced to submission by the English detachment and pardoned in 1793. After Captain Welsh's departure, he again assumed sovereign power as appears from No. 4 [the  $\frac{1}{4}$ -Re. of *Śāka* 1719=A.D. 1796-7], and, as

<sup>1</sup> *Sic.* Dr. Wilson apparently thought the Moāmariās were followers of a 'spiritual chief entitled the Maha Mari'. For possible derivations of the name *vide* Gait (*op. cit.*, 1906 ed., p. 58).

No coins of Bharatha Simha later than those of 1796-7 A.D. are known, so possibly the rebellion and death of 'Bharati Raja' of Bengmara, mentioned by Gait (*idem*, p. 216) as having occurred in 1799, after Kamaleśvara Simha's accession, may—if the date is correct—refer to yet another revolt by his successor in the leadership of the Moāmariās (? Bharatha Simha's son).

Buchanan states, was shortly afterwards taken and put to death by the Minister of Gaurināth.'

SARVĀNANDA SĪMHA, Rājā of Matak.

( (?) 1715-7 Śāka=(?) 1793-5 A.D.)

This temporary usurper of the throne of Assam towards the end of the reign of Gaurinātha was Vaishnava leader of the Morāns—a Bodo tribe that the Ahoms found in possession of the hinterland to the modern town of Dibrugarh, when they entered Assam at the beginning of the 13th century A.D. and with whom they intermingled.

Sarvānanda's capital was Bengmara, 10 miles east of Dibrugarh, and he only seems to have struck coins in 1716 and 1717 Ś.<sup>1</sup> Three of his coins were found in the Amherst Collection, two of them being Rupees of the date 1716. One of these is identical with S.C. No. 1, while the other is similar in inscription to the rupee of 1717 in the Shillong Cabinet. It differs, however, in the ornamentation of both Obverse and Reverse. On the Obverse (besides the Dragon to L.) there is a square of 4 dots between Śāka and date. On the Reverse, in addition to the dot and crescent over the *padma* of l. (2) there are groups of 3 dots at angles 6 and 7, as well as single dots (*a*) above and below the first *pa* : (*b*) below the *dva* in l. (2) : and (*c*) below the initial *ma* in l. (3).

The third coin is an undated ½-Re. which is similar in inscription to S.C. No. 6, but differs from it is not even having the 3 dots of ornamentation at angle 2 of the Reverse.

The Morāns appear to have again revolted under the leadership of Sarvānanda at Bengmara in the reign of Gaurinātha's successor, Kamaleśvara Sīmha, in 1727 Ś. (=1805 A.D.),<sup>2</sup> but as the rebellion was quickly suppressed, possibly there was little chance of Sarvānanda having been able to strike coins on this occasion. The Morāns however continued to enjoy semi-independence, and for 16 years after the transfer of the suzerainty of Assam to the British by the treaty of Yandabo in 1826 A.D. Matak was not included in British India (Gait, *op. cit.*, pp. 285-6 and 306).

The 1727 Ś. revolt of the Morāns is otherwise noteworthy for the fact that, while it was in progress, Burmese aid was invited by the rebels in their struggle against their overlord. It is true that the two parties who came did not stop long in Assam, but the visits must have resulted in valuable information being taken back to Ava, and so contributed a decade later to the

<sup>1</sup> The White King coin, mentioned by Allan (*op. cit.*, p. 328, n. 14) as having the date 1715 Ś. is not among the Assamese coins of Sir R. Burn, who purchased this portion of the White King collection.

<sup>2</sup> Vide Gait, *op. cit.*, p. 218.

decision of the Burmese monarch to take an active part in Assamese affairs.

### KAMALEŚVARA ŚIMHA.

(1717-1732 Śāka=1795-1810 A.D.)

As is suggested by the fact that the only dated coins struck in this reign are all of the same year 1720 Ś., i.e., 3 years after Kamaleśvara being placed on the throne of Assam, he was merely a puppet King, appointed by Gaurinātha's *Burha Gohain*, or Prime Minister, and content to leave all affairs of State in his Minister's capable hands. The scarcity of coins struck in Kamaleśvara's name is probably also an indication of the constant revolts that occurred during the first ten years after Gaurinātha's death. Two of these have already been referred to, viz.: the renewed rebellions of Bharatha Simha in 1718-19 Ś. and of Sarvānanda in 1727.

Previous to the discovery of the Amherst collection, the only known coins of Kamaleśvara were two Mohurs of 1720 (in the cabinets of Mr. Botham and Sir Richard Burn respectively), a few rupees of the same year, and a few undated  $\frac{1}{2}$ - and  $\frac{1}{8}$ -Rupees. Of the three Amherst coins, one is an undated  $\frac{1}{2}$ -Re. apparently identical with S.C. No. 2, the second a previously undescribed and undated  $\frac{1}{2}$ -Re. which has the same inscription as the last-named coin, but differs from it in having, as ornamentation of the Obverse, three groups of 3 dots each at the beginning and end of the first line and over the second *Śrī* (instead of being entirely devoid of ornamentation on this face); while the third is a new  $\frac{1}{8}$ -Mohur. The inscription on the faces of this coin is the same as in the  $\frac{1}{8}$ -Re. described under S.C. No. 3, but differs from it in having as ornamentation on the Obverse a rosette of 5 dots at the bottom (instead of a group of 3 dots) and on the Reverse only 2 (or 3) dots between the initial syllables of ll. (1) and (2), instead of the five small groups of dots found in the Shillong specimen.

### CHANDRAKĀNTA ŚIMHA.

(1732-1740 Śāka=1810-18 A.D.: restored by the Burmese in 1741 Ś.=1819 A.D.: fled to Bengal the following year.)

On Kamaleśvara's death from smallpox in 1810 A.D. the Burha Gohain placed Kamaleśvara's younger brother Chandrakānta on the throne; and the fact that the latter was still only a youth at the time may be one of the reasons for the complete absence of any coins bearing his name, for the first period of his nominal rule—even after the first Burmese invasion in 1816-7 A.D. and the Burha Gohain's death. The latter's successor in office evidently continued to regard Chandrakānta as a puppet King, and when, less than a year later, the new Minister was

assassinated and the late Burha Gohain's son took his place, the first step he took was to depose Chandrakānta, and to place a grandson (or great-grandson) of Rajeśvara Siṃha, named Brajanātha on the throne. News of this having been communicated to Burma, another Burmese army was sent to reinstate Chandrakānta, and for the next two years—1741 and 1742 Ś.—coins were struck in his name. Chandrakānta, however, soon found that he had even less authority under the Burmese Generals than with Ministers of his own race, and in the following year he fled to British territory. There he raised bands of mercenaries, with which for some time he carried out unsuccessful raids against the Burmese. This led to counter-raids by the Burmese into British territory, which ultimately forced the British to intervene in Assamese affairs. After the conclusion of the Burmese war, Assam for 6 or 7 years was administered as British territory, and when finally it was decided to try the experiment of again placing Upper Assam under Assamese rule, Chandrakānta was not considered the best candidate for the headship of the new State, and Purandar, a son of Brajanātha Siṃha, was selected instead of him.

The Amherst coins of this King include two similar Rupees of 1741 Ś. with the same inscriptions as those found on the two Shillong varieties of this year, but differing from both of them in having on the Obverse no group of dots either between the beginnings of ll. (2) and (3), or near the Dragon; while on the Reverse there is no group of dots above the top line, and that between the beginnings of ll. (3) and (4) is differently placed. There are two  $\frac{1}{4}$ -Rs. of 1741 and 1742 Ś. respectively, neither of which is found in the Shillong Cabinet. The latter date is noteworthy, as previously the only known coins of 1742 were a Rupee and  $\frac{1}{4}$ -Re.—both in Mr. Botham's Cabinet. The remaining three coins include two similar undated  $\frac{1}{2}$ -Rs. (with the same inscriptions as on S.C. Nos. 3–5, but differing in the details of ornamentation); and a  $\frac{1}{32}$ -Re. which has the same inscription as that of the  $\frac{1}{16}$ -Re. catalogued as S.C. No. 8, but is again different in ornamentation from the latter, both as regards Obverse and Reverse.

#### BRAJANĀTHA SIṂHA.

(1739-40 Śāka=1818 A.D.)

The circumstances through which Chandrakānta was superseded by this Prince have already been mentioned, and from the comparatively large number of Brajanātha's coins that are found in various Cabinets it might be concluded that he remained on the throne for at least as long as his predecessor. He appears, however, to have only reigned for about 3 months at the end of 1739 Ś. and the beginning of the following Śāka year, or, in other words, from February to April or May,

1818 A.D.<sup>1</sup> The *Buranjis* (Assamese Chronicles) state that Brajanātha was then replaced by his son Purandar Siṃha on the excuse that he was ineligible, under Ahom custom, to be King, owing to this having suffered some sort of mutilation.<sup>2</sup> In any case, nothing more is heard of him.

An undated Half-Mohur of Brajanātha, which is apparently the first to be recorded, was found in the Amherst Collection. The inscriptions are the same as in the  $\frac{1}{2}$ -Rs. (e.g. S.C. Nos. 6-8). The ornamentation of the Obverse is a semicircle and dot over the second *Śrī*, and a group of 3 dots at angle 7 (end of first line); while on the Reverse there is a similar group at angle 8. Another Gold coin—a Mohur, dated 1739 *Ś.*—was obtained by purchase.<sup>3</sup> This has the same inscriptions as the B.M. Mohur of 1739 *Ś.*; but the latter is apparently devoid of ornamentation on both sides. The new Mohur is chiefly characterized by having the Dragon to L. at the bottom of the Obverse, only very sketchily shown. The only other ornamentation on this side is a group of 3 dots at the beginning of the first line (side 2). On the Reverse, there is a semicircle with 5 dots above the *Ra* of *Rādha*, and a group of 5 dots at the beginning of the first line (angle 2). The defective representation of the Dragon (which is also found in the Shillong Mohur of 1740—S.C. No. 4) suggests that the coin was struck in a period of political confusion, and probably not at the official mint. (For reproduction of this Mohur *vide* No. 7, Pl. 5).

The two Rupees of 1740 *Ś.* found in the Collection differ in ornamentation from one another as well as from that of S.C. No. 5, and the same is the case with the two undated  $\frac{1}{2}$ -Rs., the ornamentation of both being different in various ways from that of the three  $\frac{1}{2}$ -Rs. at Shillong (S.C. Nos. 6-8). The two Amherst  $\frac{1}{4}$ -Rs. are dated 1739 and 1740 *Ś.* respectively. The latter is new to the Shillong collection, though specimens are to be found in the cabinets of the British Museum and Mr. Botham. The former differs from S.C. No. 3 in having no dots on the Obverse while on the Reverse there are two groups of 3 dots below the date, and segments with 3 dots at sides 1, 3 and (probably) 7. The segment at side 1 has also a semicircle to its right and left.

<sup>1</sup> *Vide J.A.S.B.*, 1910, p. 644. Dr. Wilson points out in his 'Description' that the legends on the Reverse of Brajanātha's coins, viz.: in the case of the Mohurs and Rupees, *Śrī Śrī Rādha Krishna Charana Kamala Makaranda Madhu Karasya*, or—in the  $\frac{1}{2}$  and  $\frac{1}{4}$  coins—*Śrī Śrī Rādha Krishna Pada Parasya*, clearly show that this King was placed on the throne by the party hostile to Chandrakānta. As the invocation of Hara Gaurī on the latter's coins indicates, Chandrakānta, like his predecessors, was a Saivite.

<sup>2</sup> Gait (*op. cit.*, p. 223) notes that Chandrakānta after he was deposed in 1739 *Ś.* had his right ear slit in order to disqualify him from again sitting on the throne.

<sup>3</sup> Indirectly from the *Toshakhāna* of the Nawāb of Dacca Estate.



The remaining Amherst coin of Brajanātha is a  $\frac{1}{16}$ -Re. which is identical with S.C. No. 11.

No coins of Purandar Simha, Brajanātha's son, are known, either for the brief period of 1740 *Ś.*, before the second Burmese invasion, when he is said to have succeeded his Father, or for the  $5\frac{1}{2}$  years, 1833–8 A.D., when he was again placed in possession of Upper Assam by the British.

#### JOGESVARA SIMHA.

(1743 *Śāka*=1821 A.D.)

This Prince—the last nominal King of Assam to strike coins—is said to have been the son of an Ava monarch by an Assamese wife, and was placed on the throne by the Burmese General Ala Mingi, after Chandrakānta had fled for the second time to British territory. The only dated coin struck in his name that was previously known was a  $\frac{1}{4}$ -Re. of 1743 *Ś.* in Mr. Botham's Cabinet, but the Amherst collection has added two more  $\frac{1}{4}$ -Rs. of this year, which differ slightly from one another in ornamentation. On the Obverse of the first there is a faint group of 3 dots over the *ra* of Jogesvara (between ll. (1) and (2) ) and—apart from other ornamentation—two groups of 3 dots each above the *ke* of *Śāke* on the Reverse. The other has no ornamentation on the Obverse, while on the Reverse the two groups of 3 dots above the top line are separated, one being above the *śa* and the other above the *e* of *Śāke*. A reproduction of the former will be found as No. 8. Pl. 5, from which it will be seen that the inscriptions, etc. are as follows:—

##### Obverse.

(1) *Śrī Śrī Jo-*

(2) *gesvara Si-*

(3) *mha nripasya.*

Group of 3 dots between ll. (1) and (2).

##### Reverse.

(1) *Śāke.*

(2) 1743.

Five groups of 3 dots each, two above l. (1), and one each to right, left, and at bottom.

The remaining two Amherst coins of Jogesvara are undated  $\frac{1}{2}$ -Rs.—apparently identical with S.C. No. 2 and Pl. V, No. 13.

Nothing is known for certain as to how long Jogesvara remained on the throne of Assam, but the fact that Chandrakānta was induced by the Burmese to return at some unspecified date before the outbreak of war with the British in January, 1824 A.D. (on the plea that Jogesvara had only been made King owing to Chandrakānta having fled the country) seems to show that Jogesvara was regarded by the Burmese as an even greater puppet than his predecessors. Chandrakānta was, however, thrown into prison at Rangpur as soon as he returned, so possibly Jogesvara remained as titular King till the final expulsion of the Burmese from Assam in 1825.

H. E. STAPLETON.

## NOTE ON TWO ADDITIONS TO THE AMHERST COLLECTION.

Dr. Stapleton has asked me to note the description of coins numbered 10 and 11 in the additions made to the Amherst Collection.

*No. 10, Tipperah Rupee* (Plate 5, No. 9).

*Obverse* : in square, with arabesques in segments.

*Śiva Durgā pa-  
de Śrī Śrī yuta  
Rājadhā + ra  
Mānikya Devaḥ*

*Reverse* : lion to left. Above, crescent and dot.

Between feet, *Śāke* 1707.

Ṛ.

This type of Rājadhara's coins differs from the more ordinary type which has the syllable *Mā* at the end of the third line instead of the beginning of the fourth, and has not the mark + between the *dha* and *ra*.

*No. 11, Manipur Rupee* (Plate 5, No. 10).

This is a coin of Chaurajit Simha of Manipur dated Ś. 1734 (1812 A.D.). A similar coin was published by Mr. Thorburn in N.S. XLII, No. 284, p. 30. but I read the inscription rather differently than Mr. Thorburn did, so give it in full.

*Obverse*

*Śrī-man Maṇipure-  
śvara Śrī Chauraji-  
ta Siṃha nṛpavara-  
sya Śāke 1734*

*Reverse*

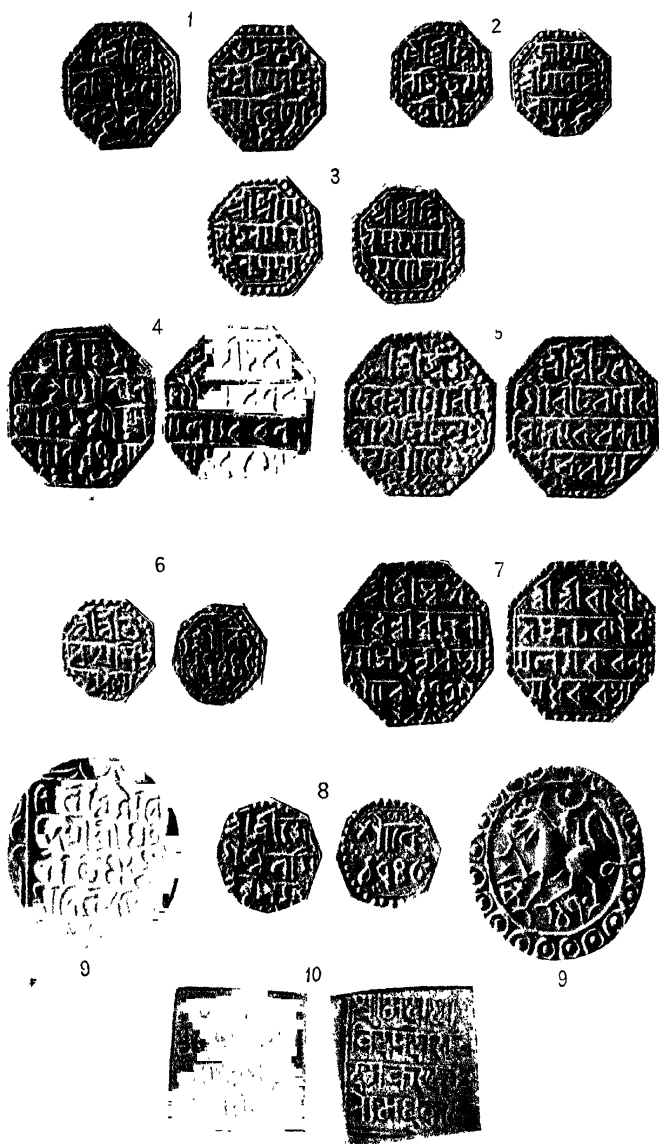
*Śrī-mad Rādhā Go-  
bind padāravin-  
da makaranda ma-  
no madhukarasya*

Square Ṛ. Wt. 173.08 grains. Diam. .83 in.

Chaurajit (not Chandrajit as read by Mr. Thorburn) Simha reigned from Ś. 1725 to 1734 (A.D. 1803-12), *vide* the table at p. 218, Cat. of Provincial Cabinet of Coins, E. Bengal and Assam, 1911. This coin was bought by Dr. Stapleton in Calcutta in 1909.

R. BURN.





Coins of North-Eastern India—Assam, Tipperah and Manipur.



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## NOTICE

His Majesty, the King Emperor, has been graciously pleased to grant permission to the Asiatic Society of Bengal to use the title 'Royal' before its name.

The Society, therefore, will henceforth be known as the 'Royal Asiatic Society of Bengal', and the *Journal* and *Year-Book* will be called *Journal of the Royal Asiatic Society of Bengal* and *Year-Book of the Royal Asiatic Society of Bengal*, and the abbreviations for references will be: JRASBL, JRASBSc, and YBRASB.

JOHAN VAN MANEN,  
*General Secretary,*  
*Royal Asiatic Society of Bengal.*

CALCUTTA,  
1, PARK STREET,  
*November, 1936.*



**The anatomy of *Otolithus ruber* (Bl. & Schn.)**

**Part I. The Endoskeleton.<sup>1</sup>**

By M. DHARMARAJAN.

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<sup>1</sup> From the University Zoological Laboratory, Madras.

## INTRODUCTION.

No suitable text-book dealing with a type Teleostean Fish is available for students studying Zoology in South India. It is to supply such a demand that this work was taken up. The Endoskeleton of *Otolithus ruber* (Sciaenidæ) is described in this part, while the anatomy of the soft parts will be dealt with later.

*Otolithus ruber* is selected as a type, for it is a very common, edible, Sciaenid fish found along the Coromandel Coast throughout its length. It grows to about two feet in length and is found in large numbers during the South-West Monsoon months—June to October.

The present investigation was carried out in the University Zoological Laboratory, Madras, under the guidance of Prof. R. Gopala Aiyar, the Director. I am deeply indebted to him for constant help and encouragement and also to Dr. S. L. Hora and Dr. H. S. Rao for going through the manuscript and offering valuable suggestions. I have also to thank the Madras University for the award of a Research Studentship which enabled me to carry on this work.

## ENDOSKELETON.

## 1. Axial Skeleton.

## (A) Head Skeleton.

The complete skeleton of the head of *Otolithus ruber* is wedge-shaped with the point of the wedge directed anteriorly. Looked at from the side, it presents a definite triangular outline. It is widest near its posterior end (the auditory region) and its length is about twice the maximum width.

The large opercular bones are very prominent and their straight ventral edges form more than one half of the ventral edge of the whole head skeleton.

In a lateral view, the greatest height of the skeleton is at the region of the pre-operculum and this is about two and a half times the height of the skull proper in this region. The skull includes those bones and cartilages of the head that are immoveably attached together, to form, in their posterior portion, the brain case; in their anterior portion the ant-orbital process and the rostrum.\* (3\*).

The bones of the skull are well ossified and hard. Many of them contain, in small crevices, plenty of fatty matter.

\* Numerals in bold type in brackets refer to the number of references in the *Bibliography* at the end of the paper.

Large muciferous cavities and canals are developed on the dorsal surface of many of the skull bones.

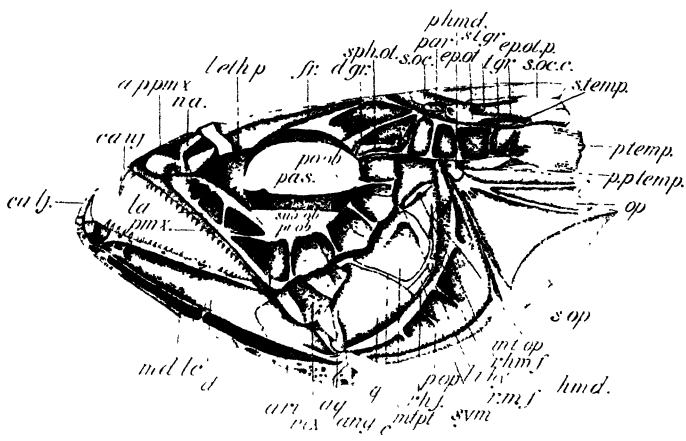


FIG. 1. Side view of the Head Skeleton ( $\times 2\frac{1}{2}$ ).

ang., angular; a.p.m.x., ascending process of premaxilla; a.q., articular head of quadrate; art., articular; c., cartilage; ca.l.j., canine of the lower jaw; ca.u.j., canine of the upper jaw; d., dentary; d.gr., dilatator groove; ep.ot., epi-otic; ep.ot.p., epi-otic process; fr., frontal; hmd., hyomandibular; int.op., inter-operculum; la., lacrymal; leth.p., lateral ethmoidal process; l.h.y., foramen for ligament from interhyal to sphenotic; md.l.c., mandibular lateral line canal; mt.pt., meta-pterygoid; m.x., maxilla; na., nasal; op., operculum; par., parietal; pas., parasphenoid; p.hmd., posterior articulatory process of hyomandibular; p.m.x., premaxilla; p.ob., post-orbitals; p.op., pre-operculum; p.p.temp., process of post-temporal uniting with opisthotic; pr.ob., pre-orbital; ptemp., post-temporal; q., quadrate; r.h.f., foramen for ramus hyoideus facialis; r.h.m.f., foramen for ramus hyomandibularis facialis; r.m.f., foramen for ramus mandibularis facialis; s.oc., supra-occipital; s.oc.c., supra-occipital crest; s.op., sub-opercular; sph.ot., sphenotic; s.temp., supra-temporal; st.gr., supra-temporal groove; sub.ob., sub-orbital; sym., symplectic; t.gr., temporal groove.

#### (a) SKULL PROPER.

The skull proper of *Otolithus ruber* is about two and a half times as long as it is broad and its maximum breadth is nearly twice the depth at its extreme hind end. The mid-ventral line of the skull, unlike that of *Scomber* (3), is perfectly straight and, therefore, its hind end forms the deepest part of the skull. The anterior end (ethmoid region) of the skull is quite narrow, and the breadth increases gradually upto the post-orbital region. Beyond this the breadth is quite the same till the posterior end, only the pterotic processes of the two sides divaricating outwards. Thus behind the orbital region, the lateral edges of the skull are very nearly straight. The mid-dorsal line

of the skull is not quite straight, the posterior half being at a higher level. The ethmoidal region is at a lower level than the frontals, so that the mid-dorsal line bends down here.

The dorsal surface of the skull is not flat. In the orbital region the lateral half of each frontal is arched upwards to accommodate the eye-ball. The frontal here shows a definite convexity. Between the two convexities of the two frontals the surface is quite flat.

From the posterior mesial corner of each frontal there arises a shallow groove, the dilatator groove (*d.gr.*), which runs outwards over the dorsal part of the sphenotic and then backwards over the pterotic and terminates at the end of that bone.

There are two more grooves, shallower than the dilatator and arising from the same point. The more lateral of the two, the temporal groove (*t.gr.*), is situated mesial to the dilatator groove, and consists of two portions, an anterior portion traversing a part of each frontal, parietal and pterotic, and a posterior portion very much depressed and opening out at the hind end of the skull. At the anterior mesial corner of the posterior portion of the depression is a cavity directed forwards and mesially. Into the posterior portion of the groove extend the trunk muscles.

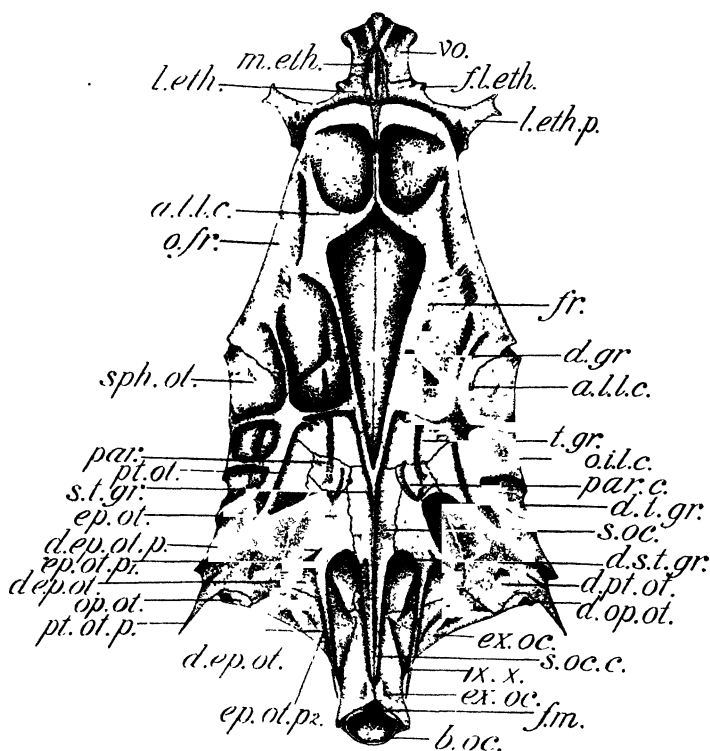
The third groove which is mesial in position and situated internal to the temporal is the supra-temporal groove (*s.t.gr.*). It is much shallower than the others. Anteriorly it bends out slightly laterally, and the two supra-temporal grooves are separated by the median supra-occipital crest. Ventral to the posterior end of the groove there is on the mesial part of the posterior surface of the skull a highly depressed portion which terminates behind at the base of the ex-occipital facets. The supra-temporal groove as a whole is very faint.

Behind the orbital region the skull is dome-shaped. The extreme posterior ends of the frontals contribute partly to the formation of this dome.

The posterior part of the skull, namely, the occipital region is at a lower level than the auditory part. The anterior half of the auditory region is accommodated in the dome while posteriorly there is a sudden fall to a lower level.

The posterior end of the skull which is rather small and constricted in appearance, bears the large concavity of the basi-occipital, the two flat ex-occipital facets and the foramen magnum.

The original chondrocranium is completely ossified, and there is little or no cartilaginous remnant in the adult except the rostral. All the bones are suturally connected with one another and their boundaries are fairly visible in the prepared skull. The sutural connections are formed in many cases by the interlocking of splint-like processes arising from the bones.

FIG. 2. Dorsal view of the Skull ( $\times 1\frac{1}{2}$ ).

*a.l.l.c.*, arch over lateral line canal; *b.oc.*, basi-occipital; *d.ep.ot.*, depressed part of epi-otic; *d.ep.ot.p.*, depression on epi-otic for lodgement of post-temporal process; *d.gr.*, dilatator groove; *d.op.ot.*, depression on opisthotic for lodgement of post-temporal process; *d.pt.ot.*, depressed part of pterotic; *d.s.t.gr.*, depressed part of supra-temporal groove; *d.t.gr.*, depressed part of temporal groove; *ep.ot.*, epi-otic; *ep.ot.p.*, epi-otic process (short); *ep.ot.pz.*, epi-otic process (long); *ex.oc.*, ex-occipital; *f.l.eth.*, facet on lateral ethmoid for palatinal articulation; *f.m.*, foramen magnum; *fr.*, frontal; *l.eth.*, lateral ethmoid; *l.eth.p.*, lateral ethmoidal process; *m.eth.*, mesethmoid; *o.i.l.c.*, otic section of infra-orbital lateral line canal; *o.fr.*, orbital elevation of frontal; *op.ot.*, opisthotic; *par.*, parietal; *par.c.*, parietal crest; *pt.ot.*, pterotic; *pt.ot.p.*, pterotic process; *s.oc.*, supra-occipital; *s.oc.c.*, supra-occipital crest; *sph.ot.*, sphenotic; *s.t.gr.*, supra-temporal groove; *t.gr.*, temporal groove; *vo.*, vomer; *ix. x.*, foramen for glossopharyngeal and vagus nerves.

The skull can be easily divided into: (1) An anterior ethmoidal or nasal region; (2) an orbito-temporal region; (3) the otic or auditory region and (4) the posterior occipital region which articulates with the vertebral column behind.



### 1. *Ethmoidal Region.*

This is the anteriormost region of the skull situated in front of and on a lower level than the frontals. This part comprises the following bones: the mes-ethmoid, the lateral or ect-ethmoids, the nasals, the vomer and the rostral.

**Mes-ethmoid: (*m.eth.*).** The mes-ethmoid is a small median, elongated bone with slight lateral projections and a flat, oval base. Mid-dorsally, from its middle portion arises an upwardly directed vertical process which goes to meet the anterior end of the frontal region. Thus, the portion of the mes-ethmoid posterior to the above process is tucked in beneath the frontals. The process is also continued as a faint ridge upto the anterior end of the bone. Ventrally, the anterior half of the bone is solid, while the posterior half is scooped out to form a concavity. This concavity is the dorsal half of the mes-ethmoidal cavity (45) and the posterior half of the mesethmoid forms its roof. The two lateral edges of the mesethmoid possess splint-like processes which effect a sutural connection with the lateral ethmoids. The mesethmoid is bounded laterally by the ect-ethmoids, posteriorly by the frontals, ventrally by the mes-ethmoidal cavity and beneath it by the vomer, while the rostral is situated dorsal to it. The anterior end of the mes-ethmoid bends down and unites with the anterior end of the vomer.

**Lateral or Ect-ethmoid: (*l.eth.*).** This paired bone which occurs one on either side of the mesethmoid, is of an irregular shape. Anteriorly it is short and stout and forms the main body of the bone. From this part arise two large, leaf-like posterior processes and a triangular postero-lateral process. The former processes unite ventrally with the frontals and the latter process (*l.eth.p.*) is directed outwards to form the anterior boundary of the orbit. This is well-ossified and is the so-called Prefrontal bone. Just where the three processes arise from the body of the bone, there is a deep dorsal concavity (the floor of the nasal cavity) which bears the foramen for the olfactory nerve.

Antero-dorsally from the body of the bone, at the base of the anterior edge of the lateral process, there arises a small process bearing a flat facet (*f.l.eth.*) at its tip. This facet is directed forwards and upwards and glides over a similar ill-defined facet at the dorsal anterior end of the palatine.

Antero-ventrally, from the inner or mesial edge of the bone arises a large downwardly and backwardly directed process. At the base of this process is a ventral, tiny, ball-like knob (*k.l.eth.*) which fits into a corresponding socket at the anterior end of the palatine. The process itself is suturally united with the anterior end of the parasphenoid by means of splint-like processes.

The anterior extremity of the frontal lies over the posterior

part of the ect-ethmoid and also projects slightly forwards to form a small roof to the posterior part of the nasal cavity. The anterior end of the ect-ethmoid unites with a dorsal, beak-like process from the vomer. The mesial edge of each ect-ethmoid roofs over the mes-ethmoidal fat cavity.

The ect-ethmoid is bounded by the frontals posteriorly, by the mes-ethmoid dorso-mesially, by the vomer anteriorly and by the parasphenoid postero-ventrally.

Both the mes-ethmoid and the ect-ethmoid are not traversed by any portion of the lateral sensory canal.

Nasal: (*na.*). The nasal is a roughly triangular bone, thin and laminate, and completely roofing over the nasal cavity. It lies in front of and flush with the frontal of its side. From very near its anterior end there is a dorsal shallow depression which widens posteriorly and is continuous with the supra-orbital lateral canal of the frontal. Anteriorly, the nasal lies over the outer ascending process of the premaxilla and the anterior extremity of the maxilla. It is united anteriorly by ligaments to the lachrymal. Its mesial edge lies parallel to the inner ascending process of the premaxilla. At its anterior tip the nasal has a minute foramen-like tunnel. The posterior lateral edge of the nasal forms the inner border of the nasal opening.

Vomer: (*vo.*). The Vomer is a ventro-median unpaired bone without teeth, with a stout, broad, anterior portion which may be called the 'head', and a thin tapering posterior shaft or 'body'. From each lateral edge of the head arises a process which projects upwards and then mesially and almost meets its fellow of the opposite side in the median line, where a dorsal ridge is formed with its posterior part overlapped by the mesethmoid. The posterior edge of each process is suturally united with the anterior edge of the lateral ethmoid. The antero-dorsal part of the head with its lateral process and the median ridge is curved downwards in the form of a beak. A concave articular surface on each side of the anterior outer end of the head gives an indirect articulation to the corresponding maxillary bone, a thin pad of cartilage separating the two articulating surfaces. Behind this articular surface there is a deep pit on the lateral process on each side into which fits an articular head from the anterior end of the palatine.

The pointed body of the vomer fits completely into a median V-shaped depression on the antero-ventral surface of the parasphenoid which extends forwards, on either side of the body of the vomer to the head.

The dorsal surface of the head of the vomer forms the floor of the mesethmoidal cavity.

Rostral: (*fig. 8a*). This is a single, thick, elongated and narrow, hour-glass-shaped piece of cartilage, with a deep median ventral groove resting on the antero-dorsal ridge of the vomer and the dorsal median ridge of the mesethmoid. On its dorsal

side rest the two inner ascending processes of the pre-maxillaries both of which it serves to bind together. Antero-laterally on each side it is connected by fibrous tissue to the anterior end of the maxillary.

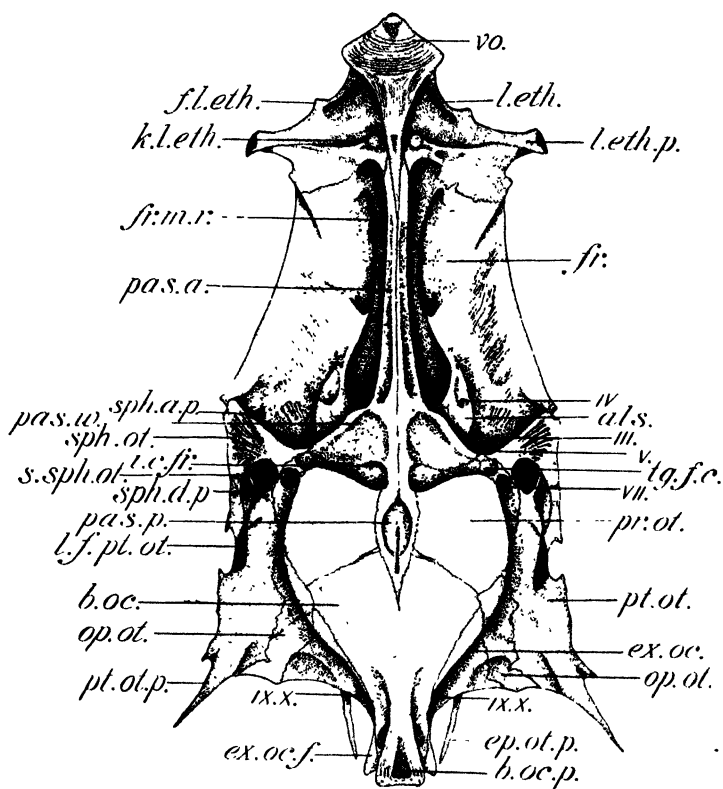


FIG. 3. Ventral view of the Skull ( $\times 14$ ).

*als.*, alisphenoid; *b.oc.*, basi-occipital; *b.oc.p.*, posterior articulatory part of basi-occipital; *ep.ot.p.*, epi-otic process; *ex.oc.*, ex-occipital; *ex.oc.f.*, articulatory facet of ex-occipital; *f.l.eth.*, facet on lateral ethmoid for articulation with palatine; *fr.*, frontal; *fr.m.r.*, mesial ventral ridge of frontal; *i.c.fr.*, internal carotid foramen; *k.l.eth.*, knob on lateral ethmoid for palatal articulation; *l.eth.*, lateral ethmoid; *l.eth.p.*, lateral ethmoidal process; *l.f.pt.ot.*, longitudinal facet on pterotic for hyomandibular articulation; *op.ot.*, opisthotic; *pas.a.*, anterior part of parasphenoid; *pas.p.*, posterior part of parasphenoid; *pas.w.*, wing of parasphenoid; *pr.ot.*, pro-otic; *pt.ot.*, pterotic; *pt.ot.p.*, pterotic process; *sph.a.p.*, pit on sphenotic opening into canal at bottom; *sph.d.p.*, dorso-lateral pit on sphenotic; *sph.ot.*, sphenotic; *s.sph.ot.*, socket on sphenotic for hyomandibular articulation; *tg.f.c.*, trigemino-facialis chamber; *vo.*, vomer; *iii.*, foramen for oculomotor nerve; *v.*, foramen for trochlear nerve; *vii.*, trigeminal opening of trigemino-facialis chamber; *viii.*, facial opening of trigemino-facialis chamber; *ix.x.*, foramen for glossopharyngeal and vagus nerves.

In the interior of the ethmoid there is a small, oval cavity having the vomer for its floor and the mesethmoid for its roof. In the fresh condition this cavity has been found to be filled with a fatty substance of semi-solid consistency. In all probability it is the 'Mes-ethmoidal fat cavity' (*m.f.c.*) described by Parker (45) in *Salmo*.

The nasals and vomer are dermal bones, while the ect-ethmoids and mesethmoid are replacing bones. The rostral remains cartilaginous even in the adult.

## 2. Orbito-temporal Region.

The Orbito-temporal region can be divided into (i) the Orbital region and (ii) the Temporal or Sphenoidal region. The former includes the two orbits with the bones that go to form the orbital ring, and the latter is sub-divided further into (a) the frontal region: and (b) the parietal region.

The frontal region includes the Frontals and the Orbito-sphenoids.

The Parasphenoid, though properly belonging to the parietal region, has a long anterior part which extends into the frontal region anteriorly and is connected with the vomer.

The Parietal region includes (1) the parietals: (2) the alisphenoids: (3) the basisphenoid and (4) the parasphenoid.

Of the bones of the Temporal region, the frontals, parietals and parasphenoid are dermal in origin, while the alisphenoids and the basisphenoid are cartilaginous in origin.

### (i) Orbital Region.

This region comprises the orbits and the orbital ring bones.

The orbits are large in size and occupy very nearly half the length of the skull. They are separated from each other only by a membranous inter-orbital septum, a bony septum being absent. The skull is therefore said to be Platybasie.<sup>1</sup>

The big orbits cut into the skull to a considerable extent. Each orbit is bounded dorsally by the frontal, anteriorly by

<sup>1</sup> As Gaupp has shown, there are two types of skull: the platybasie and the tropibasie. In the former the trabeculae remain wide apart in the orbito-temporal region, an intertrabecular plate unites them in front, and an extensive brain cavity is continued forward to the nasal capsules. This possibly more primitive type is found in the Chondrichthyes and lower Osteichthyes (*Acipenser*, *Amia*, *Polypterus* and some Teleostei such as the Cypriniformes among living forms), Dipnoi and Amphibia. In the tropibasie type the trabeculae tend to fuse immediately in front of the hypophysis to form the base of median interorbital septum continuous with the internasal septum farther forward.

This type occurs in a very pronounced form in the majority of Teleostei and also in the birds and higher reptiles. (35, p. 235).

the lateral process of the lateral ethmoid, posteriorly by the sphenotic and the anterior edge of the alisphenoid and mesially by the membranous septum.

There are five bones, all of them dermal in origin, which contribute to the formation of the orbital ring. All these bones do not form a definite ring because the dorsal supra-orbital is absent. The ring is, however, completed by the part of the frontal in this region. The posterior part of the Lachrymal which is the anteriormost of the five bones, and the remaining four successively one behind the other, the Pre-orbital, the Sub-orbital and the two Post-orbitals, go to form the orbital ring. The second post-orbital secures attachment with the lateral edge of the sphenotic. The pre-, sub-, and post-orbitals are traversed by the infra-orbital lateral line canal.

The Lachrymal (*la.*) is an elongate, roughly rectangular bone situated at the anterior ventral part of the orbit, and directed forwards and upwards. The anterior end of the bone is narrower than the posterior, and the ventral edge longer than the dorsal. In the middle of its dorsal edge there is an inwardly directed process which is connected to the free end of the lateral process of the ect-ethmoid by fibrous tissue and a tiny ligament. The whole lachrymal is situated above the maxillary which it almost entirely hides from view. Its anterior end is connected by fibrous tissue to the anterior end of the maxillary. Its upper edge is thick and the lower edge thin as is the case with all the orbital ring bones. Posteriorly the lachrymal has a V-shaped indentation into which fits the V-shaped anterior end of the post-lachrymal or pre-orbital bone. The lachrymal extends far forwards and its anterior end is united to the antero-lateral edge of the nasal.

The Lachrymal is traversed throughout its length by the infra-orbital lateral canal which is enclosed by processes on the bone.

The Pre-orbital (*pr.ob.*), or the Post-lachrymal of some authors (3), is a flat bone of irregular shape with a V-shaped pointed anterior end which fits into the posterior part of the lachrymal. Its inner edge is much thickened. Posteriorly it is attached to the infra-orbital. It also overlaps the maxilla to a certain extent.

The Infra-orbital or sub-orbital (*sub. ob.*) is a rectangular bone with an irregular outer edge and a concave inner edge. From the middle of its inner edge there is a sharp process, the suborbital shelf, directed inwards into the orbit. The infra-orbital is attached to the pre-orbital in front and the post-orbital behind.

The Post-orbitals (*po. ob.*) are situated next to the infra-orbital. Each is a four-sided bone with a curved, concave inner edge. The first post-orbital is attached to the infra-orbital in front and to the second post-orbital behind; the latter secures

attachment to the lateral edge of the sphenotic and thus completes the orbital ring.

(ii) *Temporal or Sphenoidal Region.*

(a) *Frontal Region.*

The Frontal Region lies between the parietal and the ethmoidal regions. The Orbito-sphenoid being absent in the skull of *Otolithus*, the frontals alone remain to be described.

The Frontals (*fr.*) form the largest part of the dorsal surface of the skull, and occupy about half the full length of that surface. They are suturally united along their entire length in the mid-dorsal line of the head. The anterior end of each frontal rests upon and is united to the posterior edge of the corresponding lateral ethmoid (Pre-frontal), and even extends beyond it slightly, forming a roof to the posterior part of the nasal cavity.

The frontal gradually widens from its anterior end up to the dorsal anterior edge of the sphenotic where its lateral edge recedes inwards and the bone itself is consequently narrow here and presents a postero-lateral recess into which fits the Sphenotic (Post-frontal).

Between the posterior edge of the lateral ethmoid and the anterior edge of the sphenotic the frontal has more than half its breadth arched up laterally and forms the entire roof of the orbit of its side.

The ventral side of each frontal has a well-formed, thick, mesial ridge extending from the lateral ethmoid to the sphenotic. The posterior end of the ridge terminates at the anterior mesial corner of the sphenotic, while its anterior end meets the corresponding arm of the V-shaped parasphenoid, immediately mesial to the olfactory foramen. The frontal ridges run almost parallel to each other upto the anterior edges of the alisphenoids, where they bend outwards to end at the sphenotic bone.

The area between the two orbital convexities is quite flat, while behind it the frontal is curved upwards, so that its posterior third is on a higher level than the anterior two-thirds. The supra-orbital region of the frontal is quite transparent and thin.

The anterior end of the frontal unites mesially with the mesethmoid and laterally the posterior edge of the nasal lies over it.

The hind edge of each frontal has an irregular outline. Mesially it overlaps the anterior edge of the supra-occipital. It also overlaps partly the anterior end of the parietal and is overlapped by it also to a little extent.

The posterior lateral edge of the bone overlaps the mesial edge of the sphenotic.

The frontal is traversed throughout its length by the supra-orbital lateral canal. There are vertical processes (*a.l.l.c.*)

arising from the dorsal surface of the bone each of which arches over a canal-like space (fig. 2).

The frontal is well-ossified in all regions except where it arches over the orbit. The ossification is marked in the region mesial to the ventral ridges and also in front of the sphenotic. In the latter region especially, the bone exhibits a more or less porous nature with fat stored in the minute crevices.

Both the pre- and the post-frontals are absent in this fish.

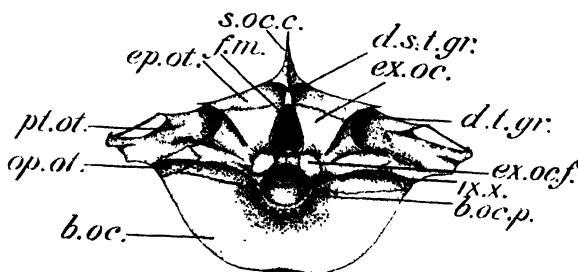


FIG. 4. Posterior view of the Skull ( $\times 1\frac{2}{3}$ ).

*b.oc.*, basi-occipital; *b.oc.p.*, posterior articulatory part of basi-occipital; *d.s.t.gr.*, depressed part of supra-temporal groove; *d.t.gr.*, depressed part of temporal groove; *ep.ot.*, epi-otic; *ex.oc.*, ex-occipital; *ex.oc.f.*, ex-occipital facet; *f.m.*, foramen magnum; *op.ot.*, opisthotic; *pt.ot.*, pterotic; *s.o.c.*, supra-occipital crest; *ix.x.*, foramen for glossopharyngeal and vagus nerves.

#### (b) Parietal Region.

The parietal (*par.*) is a flat, leaf-like, ear-shaped bone with a posterior indentation and a prominent dorsal crest directed upwards and backwards. The two parietals are small in size and do not meet in the middle line, being separated by the median supra-occipital crest which extends to the posterior end of the frontals. The mesial edge of each parietal slightly overlaps the dorsal edge of the supra-occipital; anteriorly also it overlaps the posterior edge of the frontals. Laterally and postero-laterally it is bounded by the pterotic whose inner edge it lies over, and postero-mesially it suturally articulates with the epiotic. At its antero-lateral corner it unites with the postero-mesial part of the sphenotic.

The parietal does not contribute much towards the formation of the roof of the cranial cavity.

The Alisphenoid (*als.*) is an irregularly triangular piece of bone forming about half of the hind wall of the orbit. It inclines forwards, upwards and slightly inwards. The entire dorsal edge of the bone is rough and is articulated to the posterior part of the mesial ridge on the frontal.

Laterally, the alisphenoid abuts against the sphenotic.

and ventrally, against the pro-otic and the basi-sphenoid. In fact, the anterior half of its ventral edge is borne by the lateral wing of the basi-sphenoid. Its antero-mesial edge forms the complete lateral boundary of the large, median, orbital opening of the brain case. The dorsal boundary of this opening is formed by the mesial ridges on the frontals and also the portion of the frontals between them. The ventral edge is formed by the anterior edge of the basi-sphenoid.

The orbital opening of the cranial cavity is closed by the posterior part of the membranous inter-orbital septum (*i.o.s*) which bends down in this region and terminates a little dorsal to the entrance into the myodome. The second cranial nerve pierces this septum and enters the orbit. This septum does not, however, close the orbital opening of the myodome.

The Basi-sphenoid (*b.sph.*) is a small median Y-shaped bone, characteristic of many Teleosts. The shank of the Y is small and thick, directed downwards and forwards, and lies nearly vertically in the middle plane of the skull. The lower end of the shank is attached to the dorsal side of the parasphenoid at the beginning of the median dorsal ridge of that bone and opposite to the anterior edges of its wings. The two arms of the Y are quite broad, each directed laterally and a bit upward. The dorsal surface of the two arms put together is concave, and forms the floor of the orbital opening of the cranial cavity. The outer edge of each arm which is directed upward is serrated and upon it rests the alisphenoid of its side, suturally connected with it. Laterally, the arm is connected to the pro-otic bone of its side. Posteriorly, behind the basi-sphenoidal arms, between them and the anterior end of the united edges of the mesial horizontal processes of the pro-otics (the pro-otic bridge), occurs a small circular opening, the Pituitary Fossa (*pit. op.*) which opens from the cranial cavity into the anterior end of the myodome. Through this fossa the hypophysis of the brain projects into the myodomal cavity.

The basi-sphenoid, according to Allis (3), originally arises from paired centres in the trabeculae but, in the adult, occurs as a median bone with paired wings.

There is a thick, membraneous Inter-orbital septum (*i.o.s*) which also closes the orbital opening of the cranial cavity. This septum is connected to the middle line of the ventral part of the frontal region and is ventrally attached throughout its length, to the median dorsal ridge on the parasphenoid. At about the middle of its length, very close to its dorsal margin, it is pierced by the olfactory nerve which then enters the orbit and runs close to it, passing on into the nasal cavity through the olfactory foramen. From the anterior end of this septum arise the *obliqui* muscles of the eye-ball.

The Parasphenoid (*pas.*) is a long, median, ventral, dagger-shaped bone with two lateral ascending wings or processes arising



from the posterior third of its body, one on each side. It occurs ventral to the primordial cranium and extends from the basi-occipital to the lateral ethmoids. In cross section the bone is V-shaped throughout its length, except at the posterior region where the two arms of the V are almost on a level with each other. A median ridge occurs in the angle of the V right through, but is broken up in the region of the lateral wings and continued posteriorly beyond it. In front of the wings the bone narrows to a small blunt end anteriorly. Behind the wings it expands into a broad, upwardly curved structure which has a small median longitudinal ventral groove and frayed edges and a posterior end tapering to a point.

In the region of the wings, and slightly in front of and also behind them, there is a deep longitudinal channel on the dorsal surface of the bone, which forms the floor of the eye-muscle-canal.

The wings are flat and thin, directed backwards and upwards. The anterior edge of each wing is straight but the posterior is slightly concave. The anterior edge forms the lower half of the hind edge of the orbit and the posterior edge overlaps the ventral half of the anterior edge of the pro-otic bone. The dorsal edge of the wing extends above the level of the horizontal mesial process from the pro-otic and reaches up to the floor of the Trigemino-facial Chamber. Between the pro-otic and the posterior edge of the wing, in the angle formed by that edge with the lateral edge of the parasphenoid, lies the Internal Carotid Foramen, the anterior edge of which is partly overlapped by the hind edge of the wing so that the foramen seems to be enclosed in the parasphenoid.

The posterior end of the vomer overlaps ventrally the anterior end of the parasphenoid to a considerable extent. In fact there is an antero-ventral recess on the parasphenoid for the reception of the body of the vomer.

With regard to the myodome or the eye-muscle-canal it may be stated that 'The Myodome is a space developed in the orbito-temporal and otic regions of the skull of Teleostomes for the accommodation of lengthened recti muscles of the eye. Strictly speaking, this space is the posterior myodome, since a similar anterior myodome is hollowed out for the oblique muscles in the ethmoid region by the enlargement of the orbito-nasal canal.

When fully developed, the myodome in the dry skull is a large space between the floor of the brain-case (pro-otic and basioccipital) and the parasphenoid; it opens behind, and communicates in front with the orbits. The myodome is supposed to have originated by the penetration into the enlarged opening for the pituitary vein of recti muscles originally inserted on the outer surface of the orbital wall.' (35, p. 279).

In *Otolithus* the myodome extends from the posterior part

of the orbit to the anterior part of the basi-occipital. It does not extend to the extreme hind end of the skull as in *Salmo* (45), but terminates at the anterior end of the basi-occipital where that bone unites with the parasphenoid. It has for its floor the broad posterior part of the parasphenoid which is slightly bent upwards behind. Its roof is formed by the wings of the basi-sphenoid, and by the whole of the mesial, horizontal processes of the pro-otics. Its sides are formed anteriorly by the lateral wings of the parasphenoid and posteriorly by the thin ventro-lateral laminal parts of the pro-otics.

Anteriorly the eye-muscle canal is wide but posteriorly it narrows considerably and almost tapers to a point. Its orbital opening is divided into two by the shank of the basisphenoid. Each orbital opening is bounded by the anterior margin of the lateral wing of the parasphenoid, by the basi-

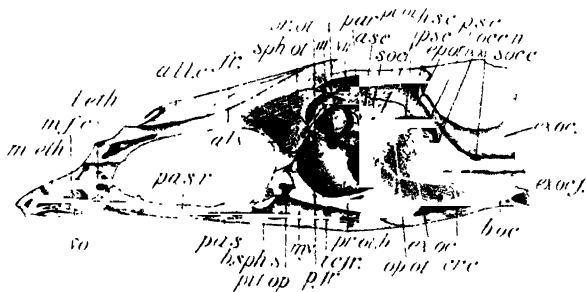


FIG. 5. Median view of the bisected Skull ( $\times 25$ ).

*alc.*, arch over lateral line canal; *als.*, ali-sphenoid; *a.s.c.*, anterior semi-circular canal; *b.oc.*, basi-occipital; *b.sph.s.*, basi-sphenoidal shank; *c.c.*, posterior part of cranial cavity; *ep.ot.*, epi-otic; *ex.oc.*, ex-occipital; *ex.of.f.*, ex-occipital facet; *fr.*, frontal; *h.s.c.*, horizontal semi-circular canal; *i.c.fr.*, internal carotid foramen; *l.eth.*, lateral ethmoid; *meth.*, mesethmoid; *m.f.c.*, mesethmoidal fat cavity; *mg.*, myodome; *occ.n.*, foramen for occipito-spinal nerves; *op.ot.*, opisthotic; *par.*, parietal; *pas.*, parasphenoid; *pas.p.*, median vertical process of parasphenoid; *p.fr.*, palatine foramen; *pit.op.*, pituitary foramen; *pr.ot.*, pro-otic; *pr.ot.b.*, pro-otic bridge; *p.s.c.*, posterior semi-circular canal; *pt.ot.*, pterotic; *s.oc.*, supra-occipital; *s.o.c.c.*, supra-occipital crest; *sph.ot.*, sphenotic; *vo.*, vomer; *iii.*, oculomotor foramen; *v.*, trigeminal foramen; *vii.*, facial foramen; *ix.*, *x.*, glossopharyngeal and vagus foramina.

sphenoid shank, also by a part of the lateral wing of the basisphenoid and by a part of the anterior edge of the pro-otic.

The myodome lodges the recti muscles of the eye, the origin of the rectus inferior being situated at the extreme posterior end of the canal. At about the middle of its length the myodome has the internal carotid foramen opening into it. Through its orbital opening on each side the recti muscles and the internal carotid artery enter the orbit.

The supra-temporal (*s.temp.*) is a thin, triangular, leaf-like, dermal bone occurring dorsally, posterior to the pterotic at the base of the pterotic process and connecting the pterotic with the post-temporal. It is traversed by two canals of the lateral line. There is a posterior arch through which the main infra-orbital lateral canal passes and extends into the pterotic and there is another mesial arch through which the supra-temporal branch of the infra-orbital canal passes.

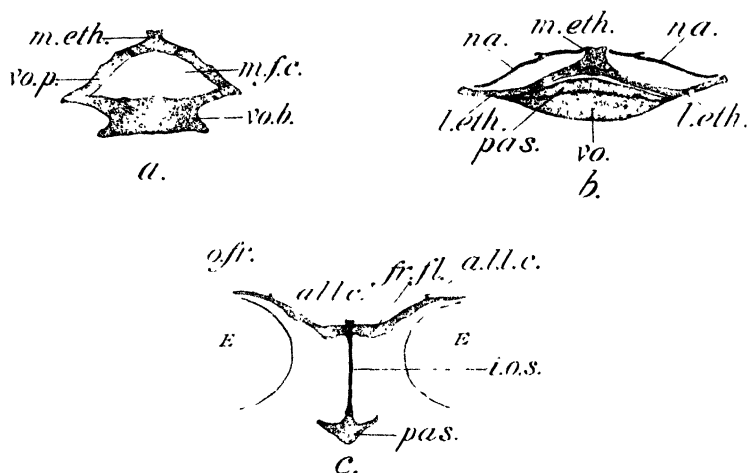


FIG. 6. Transverse sections through three regions in the anterior half of the Skull ( $\times 1\frac{1}{2}$ ).

*a.*, through the mesethmoidal region. *b.*, through the nasal region. *c.*, through the orbit.

*a.l.l.c.*, arch over lateral line canal; *e.*, eye; *fr.fl.*, flat part of frontal; *i.o.s.*, membranous inter-orbital septum; *l.eth.*, lateral ethmoid; *m.eth.*, mesethmoid; *m.f.c.*, mesethmoidal fat cavity; *na.*, nasal; *o.fr.*, orbital elevation of frontal; *pas.*, parasphenoid; *vo.*, vomer; *vo.b.*, body of vomer; *vo.p.*, anterior process of vomer.

### 3. Otic or Auditory Region.

In all craniates the auditory capsule of the skull is situated between the facial and the glosso-pharyngeal nerves. In Teleosts it arises as a single piece of cartilage—the Otic Cartilage—which secures connection with the parachordals below. In the otic cartilage five centres of ossification occur which may be recognised as the five bones of the adult fish, namely, the Pterotic, the Epitotic, the Pterotic, the Sphenotic and the Opisthotic. In *Otolithus* all these five bones unite to form a closed capsule posteriorly on each side of the cranial cavity.

The Pro-otic—(The Petrosal)—(*pr.ot.*), is a large irregular bone forming the antero-mesial and antero-dorsal wall of the auditory capsule. The bone may roughly be said to have a thick body whose posterior portion is depressed in the form of a quadrant of a circle, this part of the bone being thin and transparent, and a mesial horizontal process or wing.

Posteriorly the body of the bone articulates with the basioccipital and exoccipital; dorso-posteriorly with the opisthotic; dorsally with the pterotic; antero-laterally with the sphenotic and antero-mesially with the alisphenoid. Antero-ventrally the body is overlapped by the lateral wing of the parasphenoid, while ventro-mesially it is united to the body of the parasphenoid.

Of these articulations the one with the basioccipital is mere apposition, the two edges lying in juxtaposition with a thin strip of cartilage separating them. In all other cases there are splint-like processes arising from the edges of the pro-otic and also the surrounding bones. The splints of one bone fit into corresponding depressions between the splints of the adjoining bone, a dove-tail sutural articulation being thus effected.

The mesial horizontal process of the pro-otic unites with its fellow of the other side and also anteriorly, with the basisphenoid and alisphenoid. The united processes together form a platform-like false floor to the cranial cavity in this region. The platform also serves to roof over the myodome and separate it from the cranial case. The mesial horizontal process lies entirely behind the pituitary opening as in *Amia*, and is therefore homologous to that of *Amia* and not to that of *Scomber* (3) where a part of the process extends anterior to the pituitary opening. The whole process of *Otolithus* may, however, be said to be homologous to that part of the process of *Scomber* which lies posterior to the pituitary fossa.

The posterior edge of the process reaches up to the anterior edge of the basisphenoid. The process itself slopes downwards posteriorly so that the myodome beneath it also becomes gradually smaller.

The thin and transparent part of the pro-otic is so marked off from the anterior thick part by a deep curved ridge that it may also be considered as a posterior process of the bone. The inner surface of the posterior part of the pro-otic is deeply concave. Antero-dorsally, on the inner surface of the bone there is a circular opening for the passage of the anterior semi-circular canal. Antero-ventrally, the bone has a small incision which lies in the angle formed by the wing of the parasphenoid with the parasphenoid itself. This incision forms the posterior boundary of the internal carotid foramen through which the internal carotid artery passes into the myodome.

Reference may here be made to the Trigemino-facial chamber (*tg.f.c.*) which was first described by Allis (4, 10) who gave the

name 'to a space occurring in the side-wall of the skull of Pisces immediately in front of the auditory capsule' (35).

In *Otolithus* it occurs antero-dorsally on the pro-otic bone as a well-defined spacious chamber with two outlets, one directed anteriorly and the other posteriorly. From in front the jugular vein (V. Capitis Lateralis) and from behind the orbital artery pass through it.

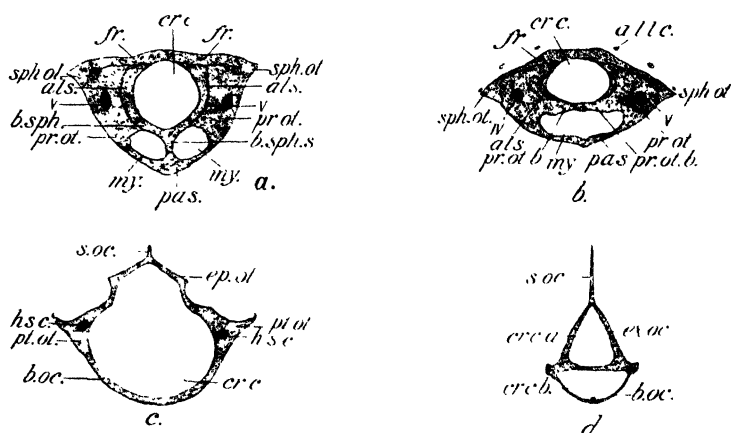


FIG. 7. Transverse sections through four regions in the posterior half of the Skull (Nat. Size.)

a, through the orbital opening of the cranial cavity; b, through the anterior part of the pro-otic region; c, through the pterotic region; d, through the occipital region.

a.l.l.c., arch over lateral line canal; als., alisphenoid; b.oc., basi-occipital; b.sph., basi-sphenoid; b.sph.s., basi-sphenoidal shank; cre., cranial cavity; cre.a., cranial cavity above ex-occipital platform; cre.b., cranial cavity below ex-occipital platform; ep.ot., epi-otic; ex.oc., ex-occipital; fr., frontal; h.s.c., horizontal semi-circular canal; my., myodome; pas., parasphenoid; pr.ot., pro-otic; pr.ot.b., pro-otic bridge; pt.ot., pterotic; s.oc., supra-occipital; sph.ot., sphenotic; v., trigeminal foramen.

Through the anterior opening emerges the Trigeminal nerve with the lateral line branches of the facial and through the posterior comes out the Hyomandibular branch of the Facial nerve. All the nerves entering the chamber pierce the wall separating it from the cranial cavity. On the inner side of the wall are situated the trigeminal and facial ganglia in a special recess.

The canal between the two openings of the chamber is called the pars jugularis since the jugular vein passes through it, while the recess for the ganglia is called the pars ganglionaris. The canal and the recess together form the Trigemino-facial chamber.

The Epiotic (*ep.ot.*)—the Exoccipitale of Allis—is roughly cone-shaped, and forms a part of the roof of the auditory capsule. From the posterior end of its flat and small dorsal surface arise the two bony Epiotic processes, the outer, small and directed slightly outwards, and the inner, long, directed backwards and extending up to the posterior end of the skull.

Mesially and antero-mesially, the epiotic adjoins the supra-occipital, ventro-laterally it adjoins the pterotic and posteriorly the exoccipital. The middle of the mesial edges of the two epiotics almost meet but for the slender supraoccipital crest which separates them. Antero-ventrally the epiotic is slightly overlapped by the posterior edge of the parietal. At the origin of the epiotic processes there is a slight depression for the lodging of the distal end of the long process of the post-temporal. This process fits into the depression and is attached to it by muscles and therefore, is capable of some movement.

The lateral and posterior sides of the bone meet posteriorly at an angle of  $60^{\circ}$ . The former forms the mesial wall of the temporal groove.

Internally, the bone is deeply concave, and its posterior and lateral faces are internally connected by a small bridge of bone enclosing a tunnel through which the posterior semi-circular canal passes. The epiotic is not traversed by the lateral line canal.

The Pterotic (*pt. ot.*)—the Squamosal of Allis—is an irregular bone occurring in the posterior dorso-lateral corner of the skull, with its posterior end at a lower level than the anterior. Postero-laterally it has a bifid process, the Pterotic process, whose ventral margin is articulated to the dorsal edge of the opisthotic. Anteriorly the bone adjoins the posterior edge of the sphenotic, and antero-mesially the lateral edge of the parietal. Postero-mesially it adjoins the lateral surface of the epiotic and posteriorly it articulates with the exoccipital and the opisthotic.

The pterotic presents three faces, the dorsal, the lateral and the mesial, the last of these depressed and at a lower level than the other two. The dorsal face lodges the posterior part of the ill-defined dilatator groove. The mesial inferior face forms the lateral wall of the posterior depressed part of the temporal groove.

On the lateral surface of the bone very near the dorsal margin is an elongated shallow groove or facet (*l.f.pt.ot.*) which lodges the posterior part of the articular head of the hyomandibular. The groove begins behind at the base of the pterotic process and inclines slightly ventrally as it proceeds anteriorwards and is continuous anteriorly with the deep socket on the lateral surface of the sphenotic which lodges the ball-shaped anterior part of the articular head of the hyomandibular.

The pterotic is traversed by the horizontal semi-circular canal which perforates internally the lower edge of the bone. Dorsally the pterotic is traversed by the otic section (3) or the temporal section (26) of the infraorbital lateral line canal.

The Sphenotic (*sph.ot.*) is a bone of irregular shape occurring dorso-laterally at the hind wall of the orbit. It is the anteriormost auditory bone, and has three sides, the dorsal, the anterior and the lateral. The anterior face is inclined forward and upward, and the lateral laterally and downward, each at right angles to the other. The dorsal face is more or less rectangular in outline, while the other two faces are roughly triangular. On the lateral face of the bone very near its ventral apex is a deep, round socket for the accommodation of the anterior ball-like part of the articular head of the hyomandibular. This socket is continuous posteriorly with a lateral groove on the pterotic.

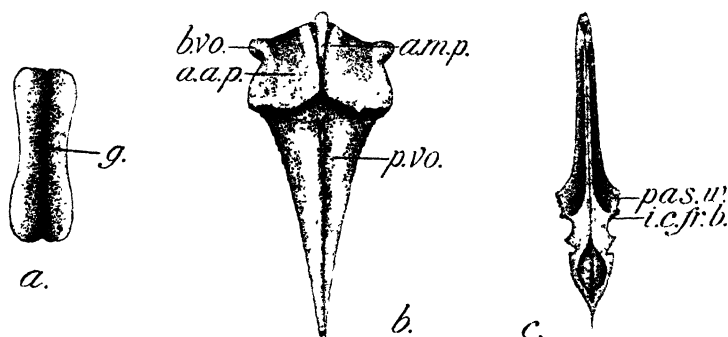


FIG. 8. Skull bones—detached.

a, Rostral ( $\times 2$ ); b, Vomer ( $\times 4$ ); c, Parasphenoid ( $\times 1\frac{1}{2}$ ).

*a.a.p.*, anterior lateral ascending process of vomer; *a.m.p.*, anterior median ascending process of vomer; *b.vo.*, body of vomer; *g.*, median groove on rostral for resting over mes-ethmoid; *i.c.fr.b.*, anterior boundary of internal carotid foramen; *pas.w.*, wing of parasphenoid; *p.vo.*, posterior V-shaped part of vomer.

The sphenotic adjoins the pterotic posteriorly, the parietal at its postero-mesial corner, the dorsal edge of the pro-otic ventrally, and the alisphenoid antero-mesially. There is no cartilage separating it from any of the bones.

On the anterior or orbital face of the sphenotic there is a well-formed deep pit (*sph.a.p.*) which I have noted in all specimens that I have examined. From the bottom of this pit there is a canal in the body of the bone, directed upwards and opening behind at the bottom of another large pit (*sph.d.p.*) found posteriorly on the sphenotic, dorsal to the socket for the

hyomandibular articulation. Allis (3) has found a similar condition in the post-orbital ossification (sphenotic) of *Scomber*. He has also noted the passage of the ramus oticus facialis through the canal to the dorsal surface of the skull. He is of the opinion that it represents the spiracular canal of *Amia*.

The internal surface of the sphenotic has a large conical depression which is usually filled with fatty tissue.

The sphenotic is not traversed by the lateral line canal, but dorsally, on its lateral edge, just behind the margin of the orbit, is a small piece of bone with a base and a process arching over it to form a canal. The base merely rests on the lateral edge of the sphenotic and can be easily removed.

The Opisthotic (*op.ot.*)—the Intercalar of Allis—is a small thin, irregular piece of bone bounded anteriorly by the pterotic and posteriorly by the exoccipital. Postero-dorsally it has a small concavity for the reception of the distal end of the smaller process of the post-temporal. In front of the opisthotic there is a small latero-ventral foramen. The opisthotic has no connection with the semicircular canals.

#### 4. Occipital Region.

This is the hindmost region of the skull, connected with the otic region in front (one of its bones, however, reaching upto the frontals anteriorly), and posteriorly giving articulation to the first vertebra. It comprises the following bones: the dorsal, median supraoccipital, the ventral, median basioccipital and the lateral exoccipitals. All the bones of this region are ossifications of the chondrocranium.

The Supraoccipital (*s.oc.*) occurs at the extreme hind end of the skull and has two parts, an anterior superior part, flush with the frontals etc., and a longer posterior inferior part inclined downwards and backwards at an angle of 120° to the former. The superior portion is slightly convex dorsally and concave internally, and extends in the form of a platform up to the hindmost point of the skull. Ventrally from about the anterior third of its length starts the inferior portion of the bone. This is slender, elongated and much narrower than the superior. The superior portion adjoins antero-mesially the posterior part of the frontal; antero-laterally it is overlapped slightly by the mesial edge of the parietal; and laterally it adjoins the mesial edge of the epiotic. Beyond the epiotic it runs as the small horizontal platform. The inferior portion adjoins antero-laterally the inferior mesial portion of the epiotic, and postero-laterally the exoccipital. Its posterior end merges imperceptibly into the supraoccipital crest.

The supraoccipital crest (*s.oc.c.*), or spine as it is usually called, arises from the anterior end of the superior part of the bone as a ridge and is directed backwards and upwards. This



ridge separates the supratemporal grooves of the two sides. The crest is thin and transparent and its posterior two-thirds can be clearly differentiated into two portions, an upper small portion and a lower portion with a curved posterior end which goes directly down and meets the two exoccipitals in the mid-dorsal line. These two parts of the crest are separated by the horizontal platform-like posterior prolongation of the antero-superior portion of the body of the supraoccipital. There is no special spine-like ending of the crest as in some Teleosts (*Scomber*).

The supraoccipital bone does not take part in the formation of the boundary of the foramen magnum nor is it traversed by the lateral line canal and its branches.

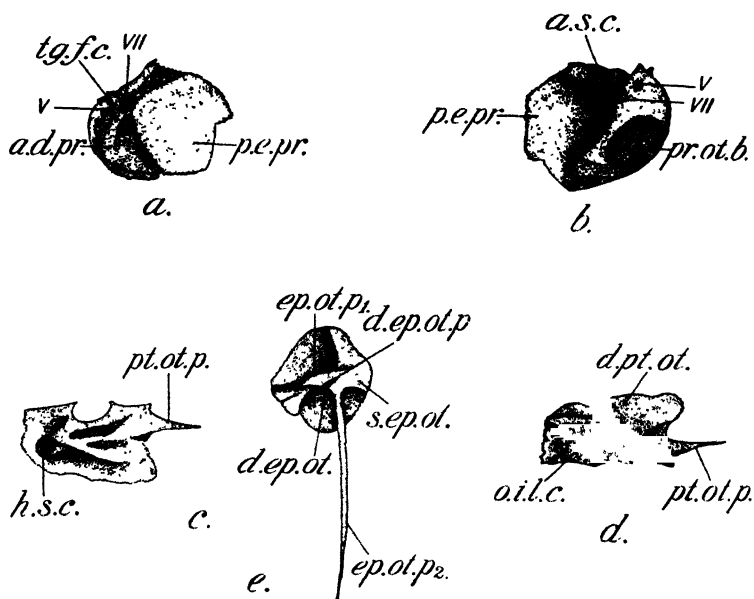


FIG. 9. Bones of the Otic region of the Skull—disarticulated ( $\times 1\frac{1}{2}$ ).

a, External view of left pro-otic; b, Internal view of left pro-otic; c, Internal view of left pterotic; d, External view of left pterotic; e, Dorsal view of epi-otic.

a.d.pr., anterior depressed part of pro-otic; a.s.c., anterior semi-circular canal; d.ep.ot., depressed part of epi-otic; d.ep.ot.p., depression on epi-otic process for lodgement of post-temporal limb; d.pt.ot., depressed part of pterotic; ep.ot.p1., epi-otic process (short); ep.ot.p2., epi-otic process (long); h.s.c., horizontal semi-circular canal; o.i.l.c., otic section of infra-orbital lateral line canal; p.e.pr., posterior elevated part of pro-otic; pr.ot.b., pro-otic bridge; pt.ot.p., pterotic process; s.ep.ot., superior part of epi-otic; tg.f.c., trigemino-facialis chamber; v., trigeminal foramen; vii., facial foramen.

The Basioccipital (*b.oc.*) is a large mid-ventral bone at the posterior end of the skull, broad anteriorly and gradually narrowing posteriorly. The thick posterior end of the bone has a deep concavity resembling that of the centrum of a vertebra, with its ventral surface slightly longer than the dorsal and the depth of the concavity almost equal to its diameter. The posterior end of the bone is connected to the anterior end of the first vertebra by ligaments. The anterior end of the first vertebra also has a deep conical depression which together with that on the posterior end of the basioccipital, forms between the two bones a compact space filled with notochordal tissue.

The myodome is not continued into the basioccipital but stops with the posterior end of the parasphenoid. Mid-dorsally on the basioccipital is a longitudinal ridge running its entire length and abutting anteriorly against the posterior end of the eye-muscle-canal.

Anteriorly the basioccipital has a ventral V-shaped depression in which the posterior part of the parasphenoid fits. Postero-ventrally also, on the vertebra-like part there is a small depression.

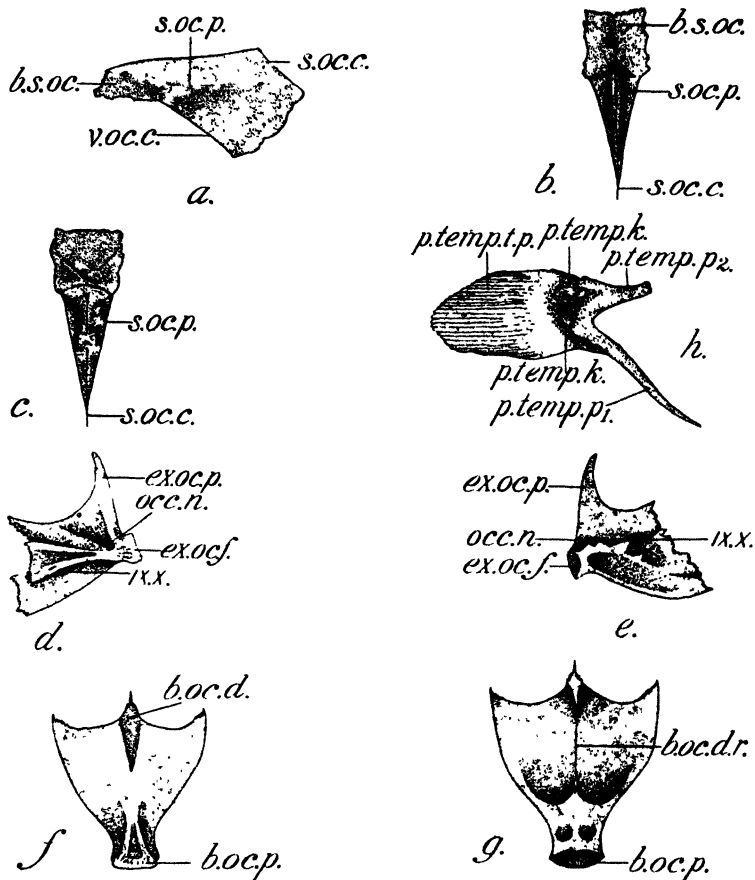
The basioccipital gives articulation to the parasphenoid mid-anteriorly, to the pro-otic latero-anteriorly, and latero-dorsally on each side it supports the corresponding exoccipital.

The two horizontal mesial processes from the exoccipitals form the floor of the foramen magnum and separate it from the basioccipital, which consequently does not take part in the formation of the foramen.

The Exoccipital (*ex.oc.*)—the 'Occipitale Laterale' of Allis—is a paired bone occurring one on each side and together forming in their posterior parts, a complete boundary for the foramen magnum. Three parts can be recognised in each exoccipital. There is a dorsal wing-like part, a middle inner mesially directed horizontal process, and a ventral wing. The dorsal process is at an angle of  $60^{\circ}$  to the horizontal process and the ventral process almost at right angles to it. The horizontal process meets its fellow in the middle line forming a platform—the floor of the foramen magnum.

The lateral expansions of the bone—the so-called Paroccipital processes—described in many fishes (*e.g.*, *Labeo rohita* by Sarbahi, 52) do not occur here.

Antero-laterally, the exoccipital adjoins the pro-otic, antero-dorso-laterally the pterotic, and antero-dorsally the epiotic. Dorso-medially it unites with its fellow of the opposite side, and the adjoining edges of the two bones are more or less covered externally by the lower edge of the posterior part of the supraoccipital crest. Ventrally, each exoccipital rests on the corresponding lateral uplifted edge of the basioccipital. The posterior part of the dorsal wing of each exoccipital is thickened considerably and this, with the corresponding thickening

FIG. 10. Skull bones --detached ( $\times 1\frac{1}{2}$ ).

a, Side view of supra-occipital; b, Dorsal view of supra-occipital; c, Ventral view of supra-occipital; d, External view of left ex-occipital; e, Internal view of left ex-occipital; f, Ventral view of basi-occipital; g, Dorsal view of basi-occipital; h, Dorsal view of left post-temporal.

*b.oc.d.*, depression on basi-occipital for lodging parasphenoid; *b.oc.d.r.*, dorsal ridge on basi-occipital; *b.oc.p.*, posterior articulatory part of basil occipital; *b.s.oc.*, body of supra-occipital; *ex.oc.f.*, ex-occipital facet; *ex.oc.p.*, posterior ex-occipital process; *occ.n.*, foramen for occipito-spinal nerve; *p.temp.k.*, knobs on post-temporal for supra-cleithral articulation. *p.temp.p1.*, post-temporal process (long); *p.temp.p2.*, post-temporal process (short); *p.temp.t.p.*, thin laminar part of post-temporal; *s.oc.c.*, supra-occipital crest; *s.oc.p.*, internal platform of supra-occipital; *v.oc.c.*, ventral margin of occipital crest uniting with ex-occipitals; *ix. x.*, foramina for glossopharyngeal and vagus nerves,

of the other side, forms the strong lateral and dorsal boundary of the foramen magnum. Between the dorsal and the ventral wings, at the level of the horizontal process, is an external, stout ridge which runs laterally throughout the length of the bone and widens out posteriorly into the large flat oval exoccipital facet for articulation with a similar facet on the first vertebra. The facets occur below the floor of the foramen magnum and above the circular concavity of the basioccipital.

About the middle of the length of the exoccipital and ventral to the lateral ridge on it, is a large oval foramen for the passage of the glosso-pharyngeal and vagus nerves. Posterior to this and dorsal to the ridge is another large foramen, which with one or two more minute foramina occurring in this region forms the exit of the spino-occipital nerves.

#### (b) VISCERAL SKELETON.

In all Gnathostomes, the Visceral Skeleton is made of seven visceral arches, which arise from the splanchnic mesoblast, and are originally quite independent of the chondrocranium proper (neurocranium) and lie in the pharyngeal wall internal to the coelom. Each arch at first arises as a half loop, the two halves later uniting in the mid-ventral line to form a single arch. The union of all the arches in the mid-ventral line gives rise to the visceral skeleton or basket.

The behaviour of the first two of these seven arches is interesting. Their connection with the chondrocranium is established early. The first or the Mandibular arch gives rise to two cartilaginous pieces—the Palato-quadrates and the Mandibular or Meckel's Cartilage. In Teleosts the palato-quadrates or the palato-pterygo-quadrates of the two sides do not meet in front in the middle line but become connected to the lateral ethmoidal processes. The posterior quadrate part serves to support the Meckel's Cartilage and the anterior pterygo-palatine part forms the roof of the palate. The Pre-maxilla, the Maxilla and the Dentary arise dermally and bear the biting teeth. The Meckel's Cartilage is usually replaced by the dermal Dentary, Articular and Angular.

The second or the Hyoid arch gives rise to the Hyomandibular which connects the two jaws to the auditory capsule, and the Hyoid arch or Cornu.

The remaining five arches are the Branchial arches which are loosely attached in front to the hyoid arch. Only the first four support the gills, while the last is transformed into the so-called Inferior Pharyngeal bones which bear teeth used in mastication. Each branchial arch is sub-divided into paired dorsal Pharyngo-branchials, Epi-branchials, lateral Cerato-branchials, and ventral Hypobranchials, united together in the mid-ventral line by a median unpaired Basibranchial.

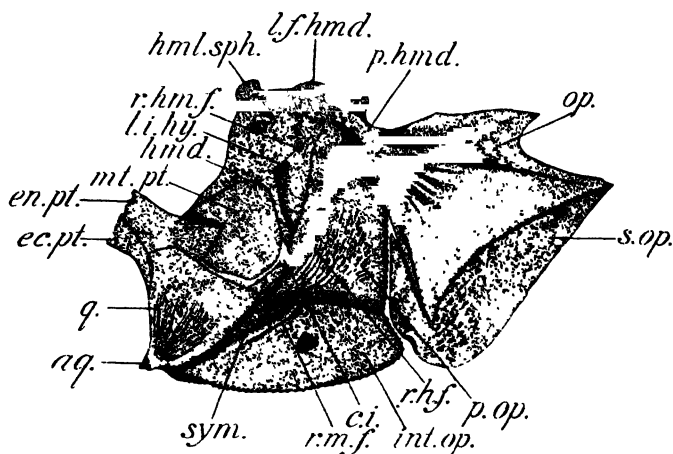


FIG. 11. Internal view of right opercular skeleton ( $\times 14$ ).

*a.q.*, articulatory head of quadrate; *ci.*, cartilaginous interspace; *ec.pt.*, ecto-ptyergoid; *en.pt.*, ento-ptyergoid; *hmd.*, hyomandibular; *hmd.sph.*, process of hyomandibular articulating with sphenotic depression; *int.op.*, inter-operculum; *lf.hmd.* longitudinal facet of hyomandibular for articulation with pterotic; *l.i.hy.*, foramen for ligament from interhyal to sphenotic; *mt.pt.*, meta-ptyergoid; *op.*, operculum; *p.hmd.*, posterior articular process of hyomandibular for the opercular; *p.op.*, pre-operculum; *q.*, quadrate; *r.h.f.*, foramen for ramus hyoideus facialis; *r.hm.f.*, foramen for ramus hyomandibularis facialis; *r.m.f.*, foramen for ramus mandibularis facialis; *s.op.*, sub-operculum; *sym.*, symplectic.

### 1. First or Mandibular Arch.

The first or the Mandibular arch, as stated before, divides into two parts—the Palato-ptyergo-quardate bar and the Meckel's Cartilage. The former is ossified into three bones, the Quadrate, the Palatine and the Metapterygoid, and it gets attached to the cranium to form the primary upper jaw. Two dermal bones, the Ecto-ptyergoid and the Endo-ptyergoid, get later on added to the bar. None of these bones forms the gape of the mouth. The adult upper jaw is formed of two dermal bones, the Premaxilla (Premaxillary) and the Maxilla (Maxillary), the former alone forming the margin and bearing teeth.

The Meckel's Cartilage is ossified only in the articular region and persists as a small rod of cartilage in the adult lower jaw. Two bones, the Dentary and the Angular, are later on added to it. These two and the articular together form the adult lower jaw.

The Upper jaw is attached to the auditory region of the cranium by the intervention of the Hyomandibular and the Symplectic. In front it is attached by the Palatine to the

ethmoidal region. It comprises the Palatine, the Ento-pterygoid (Endo-pterygoid, Meso-pterygoid), the Ecto-pterygoid (Transpalatine), the Quadrate, the Metapterygoid, the Premaxilla and the Maxilla.

The Palatine (*pal.*) is a large, thin, transparent, edentulous bone with a pointed posterior end which abuts against the anterior surface of the downwardly bent arm of the ecto-pterygoid. Its ventral edge is smooth and concave, while its dorsal edge is quite straight but for a few bony splints at its anterior end. Directed outwards from the dorsal edge is a thin tall ridge of bone exactly at right angles to the leaf-like body of the bone. This ridge runs anteriorly and merges into a thick and massive articulatory process arising from the anterior end of the palatine. The process is directed downwards and outwards, and dorsally at its base is a deep V-shaped concavity into which the ventral ball-like knob of the lateral ethmoid fits. Anterior to this depression is a dorsal ill-defined facet which glides under a similar one found dorsally on the lateral ethmoid at the base of the lateral ethmoidal process.

Ventrally also there is a small facet on the palatine at the base of its articulatory process. This facet glides over a flat surface at the lateral corner of the diamond-shaped head of the vomer.

The articulatory process of the palatine is directed anteriorly, its tip being lodged in a depression on the anterior dorsal edge of the maxilla and bound to it by connective tissue. Antero-dorsally, the palatine has splint-like processes (behind the articulatory process) which articulate with similar processes at the anterior end of the ecto-pterygoid. For the rest of the length of its dorsal edge it adjoins the ventral edge of the ento-pterygoid.

The Endo-pterygoid (*en.pt.*)—Pterygoid—is a leaf-like triangular bone occurring dorsal to the palatine and the ecto-pterygoid. Anteriorly it unites with the palatine: its whole lateral edge adjoins the ecto-pterygoid, and posteriorly it passes inwards of the meta-pterygoid uniting with the inner face of that bone. From its lower posterior angle there is a splint-like process which unites with the inner face of the quadrate. The mesial edge of the endo-pterygoid is free. The whole bone is quite transparent except at the posterior lower angle where ossification is pronounced.

The Ecto-pterygoid (*ec.pt.*) is a well-ossified, laterally compressed, L-shaped bone with its long arm wedged in between the endo-pterygoid and the palatine and the short, pointed arm, about half the length of the former, bent downwards and backwards. The dorsal edge of the long arm adjoins the lower edge of the endo-pterygoid throughout while its ventral edge adjoins the palatine only for the anterior three-quarters of its length. Ventrally, the bone has a V-shaped depression

slightly anterior to the bend and in this is received the pointed posterior end of the palatine. The entire posterior edge of the short arm adjoins the quadrate while its anterior edge is free.

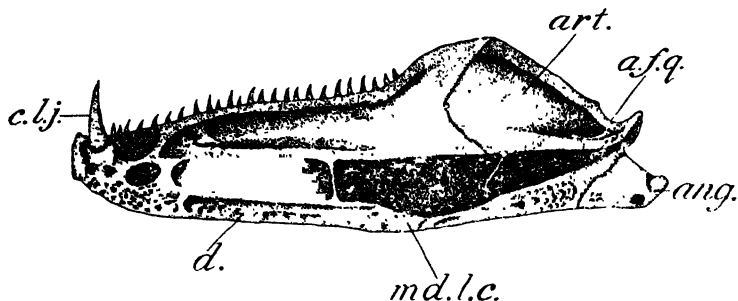


FIG. 12. External view of left half of lower jaw ( $\times 2$ ).

*a.f.q.*, facet on the articular for quadrate; *ang.*, angular; *art.*, articular; *c.l.j.*, canine of lower jaw; *d.*, dentary; *md.l.c.*, mandibular lateral line canal.

The Quadrate (*q*) is a triangular bone with straight dorsal and ventral edges and a convex posterior edge, and resembling a quadrant of a circle. It fits into the lower part of the concave anterior end of the pre-opercular bone, and is thickened along the posterior edge, with a shallow groove extending upto very near its posterior angle. Into this groove fits the anterior end of the pre-opercular. The posterior thickening is also continued dorsally to a short distance beyond the body of the bone as a small process behind the symplectic.

At the posterior lower angle of the quadrate there is an articular surface (*a.q.*) which is concave in a transverse direction and convex in the longitudinal. This surface usually possesses a cartilaginous lining and gives articulation to a corresponding surface at the posterior dorsal surface of the articular of the lower jaw.

On the inner surface of the quadrate, parallel to its posterior convex edge, is a long V-shaped groove the apex of the V almost reaching up to the articular surface of the bone. This groove lodges the symplectic bone. The symplectic, however, does not entirely fill the groove, and the small amount of space between it and the posterior dorsal process of the quadrate is occupied by the *ramus mandibularis facialis* which passes through this region.

Dorsally, separating the quadrate and the lower edge of the meta-pterygoid, is a thin line of cartilage. Antero-dorsally it unites with the posterior splint from the endo-pterygoid. Antero-ventrally it unites with the posterior end of the downwardly directed short arm of the ecto-pterygoid.

The Meta-ptyergoid (*mt.pt.*) is a large roughly four-sided bone lying dorsal to the quadrate and ventral to the hyomandibular. Its anterior edge is free except at its lower third where it overlaps the posterior end of the endo-ptyergoid. Dorsally it articulates with the ventral edge of the main body of the hyomandibular. Posteriorly the upper half of its edge adjoins the rod-like process of the hyomandibular and slightly overlaps it. The lower half of its posterior edge adjoins the symplectic which is also overlapped by it.

Ventrally the meta-ptyergoid possesses tiny bony splints which pass inner to the cartilaginous lining separating it and the quadrate.

About the middle of the dorsal edge of the bone there is a slight indentation which partially bounds a circular opening (*l.i.hy.*) directed upwards. A similar indentation on the ventral edge of the hyomandibular completes the boundary of the opening through which a large tendon-like ligament passes dorsalwards (from internal to the hyomandibular arch) and is inserted on the antero-lateral corner of the sphenotic. The other end of the ligament is connected to the interhyal bone.

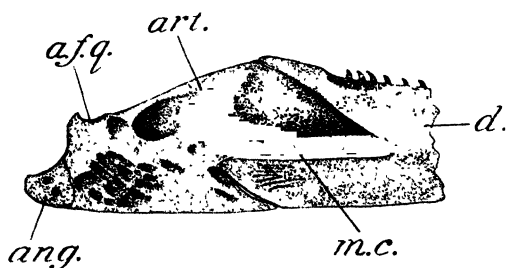


FIG. 13. Internal view of posterior part of left half of lower jaw ( $\times 1\frac{1}{2}$ ).

*a.f.q.*, facet on the articular for quadrate; *ang.*, angular; *art.*, articular; *d.*, dentary; *m.c.*, meckel's cartilage.

The Premaxilla (*pmx.*) is a long curved bone slightly shorter than the maxilla and with a sharp posterior end. Its triangular anterior end which is upwardly and backwardly directed (with the apex of the triangle directed upwards) forms the anterior ascending process (*a.a.pmx.*) of the bone. There is a posterior ascending process (*p.a.pmx.*) broader but shorter than the anterior, situated slightly in front of the extreme posterior end of the bone. Between the two processes the bone is slender and rod-like.

In front of the anterior ascending process of the premaxilla there is a laterally compressed process (*f.a.pmx.*) ascending at right angles to the body of the bone, pointed at its free end and directed upwards and slightly forwards. Its free end is



almost united to the end of its fellow of the opposite side and bound to it by connective tissue, and the two processes lie over the rostral, completely hiding it from view. The processes are so long that they abut against the median line of the frontal region. They meet dorsally, enclosing a triangular depression between them at the anterior end of the skull and in the basal part of this depression lie the tips of the canines of the lower jaw when the mouth is closed. The nasal bone lies on the side of each process.

The straight ventral edge of the premaxilla bears a strong lateral ridge throughout its length. Posterior to the second anterior ascending process, the whole premaxilla is overlapped by the maxilla, and only the anterior ascending process, the ventrolateral ridge and the part of the bone below it are visible externally. There is no definite articulation between the premaxilla and the maxilla, but the second anterior ascending process of the former has at its inner posterior surface a knob which fits into a socket at the anterior end of the latter.

The whole ventral edge of the premaxilla bears two rows of teeth, an outer, consisting of a few large downwardly and backwardly directed stout teeth, and an inner zig-zag row of

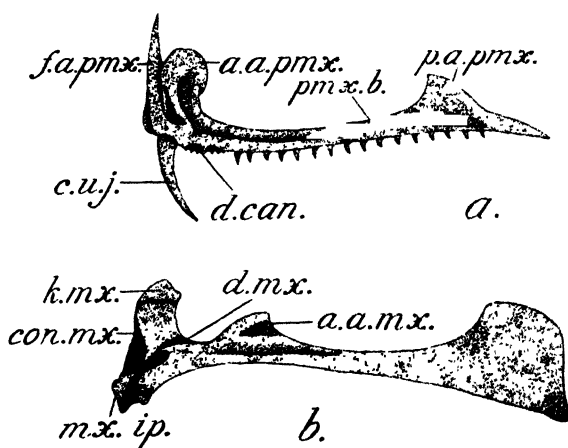


FIG. 14. The maxillary bones ( $\times 1\frac{2}{3}$ ).

*a*, The pre-maxilla ; *b*, The maxilla.

*a.a.mx.*, anterior ascending process of maxilla ; *a.a.pmx.*, anterior ascending process of pre-maxilla ; *con.mx.*, concavity for lodging the second anterior ascending process of pre-maxilla ; *c.u.j.*, canine of the upper jaw ; *d.can.*, position of fallen canine ; *d.mx.*, U-shaped depression on maxilla lodging the palatal process ; *f.a.pmx.*, pointed, flat, anterior ascending process of pre-maxilla ; *k.mx.*, knob of maxilla gliding over lateral ethmoid ; *mx.ip.*, inwardly directed process of maxilla ; *p.a.pmx.*, posterior ascending process of pre-maxilla ; *pmx.b.*, compressed body of pre-maxilla.

more numerous, small, villiform teeth. Very often no definite row may be recognised, the whole edge of the bone inner to the outer row being studded with teeth. One or two teeth of the outer row, on either side of the middle line, may be specialised into large canine teeth characteristic of *Otolithus*. Two canines usually occur on each half of the upper jaw, but occasionally three on one side and two on the other, and more rarely three on each side. On the anterior end of each dentary, are slight depressions with small canals at their bottom and into these canals are lodged the tips of the premaxillary canines when the mouth is closed.

The gape of the mouth is formed entirely by the premaxilla.

The Maxilla (*mx.*) is a long, thick, curved bone, very broad behind and abruptly becoming narrow in front and lying dorsal to the premaxilla. Anteriorly it has a small ascending process (*a.a.mx.*). In front of this the bone has another process, thick, stout and directed inwards, downwards and slightly forwards (*mx.i.p.*). On the anterior face of the bone, at the origin of this process, is a deep concavity (*con.mx.*) into which the second ascending process of the premaxilla fits. The dorsal wall of the concavity is raised up and terminates in a well-defined knob (*k.mx.*) which articulates with the ect-ethmoid of its side in front of the lateral ethmoidal process. The inwardly directed stout process is connected to the antero-lateral side of the vomer by fibrous tissue. Posterior to the depression mentioned above and in front of the small process of the maxilla, is another U-shaped depression (*d.mx.*) which lodges the tip of the anterior process of the palatine.

The maxilla is convex on its outer surface. It overlaps the premaxilla throughout, the latter bone reaching to about three-fourths of the length of the former, and its posterior end lies over the anterior part of the articular.

The maxilla bears no teeth and takes no part in the formation of the margin of the upper jaw. External to it lies the lachrymal with its anterior edge adjoining the nasal and hiding completely from view nearly five-sixths of the maxilla. The pre-orbital covers the postero-dorsal part of the maxilla.

The Lower jaw, as already stated, is in the form of a single cartilaginous piece—the Meckel's Cartilage—which secondarily gets partly replaced by bone and also has dermal bones attached to it. Thus in the adult fish three bones are recognized, the Dentary, the Articular and the Angular. The Meckel's Cartilage may also persist in the adult, as in *Otolithus*, as a slender cartilaginous rod.

The double origin of each of the three bones of the lower jaw is interesting. The articular and the angular are formed by the fusion of endochondral and dermal elements. Similarly the dentary originates as the result of a fusion between

a true dermal dentary and a small anterior endochondral element which probably represents the Mento-Meckelian (35, 49, 50 and 45).

In the lower jaw of *Otolithus* all the three bones and the Meckel's Cartilage are present.

The Dentary (*d.*) is a large, broad, elongated bone, narrow in front and of uniform breadth posteriorly, having, in this region, a V-shaped indentation on its inner aspect. Laterally, on the outer face of the bone at about the middle of its breadth and running its whole length is a strong ridge below which is a broad shallow groove with the anterior end of the mandibular lateral canal situated in it.

The whole dorsal edge of the dentary except the hind extremity bears a single row of small well-developed teeth. On either side of the mid-anterior line there is a large canine on each dentary. The two canines lodge in the depression between the two anterior ascending processes of the premaxillæ, in the closed condition of the mouth.

The anterior end of the dentary bends slightly mesially and unites with its fellow of the opposite side along a straight line but the surface of the uniting end is rugged.

The V-shaped indentation is continued in the interior of the bone to its front end, as a tiny groove maintaining a dorsal position. Into this groove extends the anterior end of the Meckel's Cartilage.

Mesially at its anterior end there is a longitudinal depression on the dentary for the insertion of the intermandibularis muscle.

The Articular (*art.*) is a large, irregular, thick bone with two anterior triangular processes, a long dorsal and a short ventral, the former nearly twice as long as the latter, and the two meeting at an angle of about 30°. From this angle starts the meckel's cartilage. The dorsal process runs into the internal groove in the dentary. The ventral process merely abuts against the posterior end of the ventral half of the dentary.

Dorsally, at the extreme hind end of the articular there is a depressed articular surface for articulation with the quadrate, concave in the longitudinal direction of the bone and slightly convex in the transverse. The posterior end of this surface rises upward as a process which is slightly bent and rests in a corresponding recess at the hind end of the quadrate. A thin lining of cartilage was noticed on the articular surface.

The external face of the ventral half of the articular presents a shallow groove in which the posterior part of the mandibular lateral canal (*md.l.c.*) is lodged.

Postero-ventrally the articular unites with the anterior end of the angular. The articular bears no teeth.

The Angular (*ang.*) is a small triangular bone found attached to the ventral half of the posterior edge of the articular, beneath the articular surface on that bone. The narrow and blunt

posterior edge of the angular has a small lateral process and is directed slightly downwards. Anterior to this process is a depression to which is attached a strong tough ligament whose broad posterior end is inserted on the inner surface of the interoperculum. The angular is not traversed by any part of the lateral line canal.

The Meckel's Cartilage (*m.c.*) is a long, thin, cylindrical rod of cartilage arising from the angle formed by the dorsal and ventral anterior processes of the articular, and extending forwards into the internal groove in the body of the dentary and terminating very near to the anterior end of that bone.

**The Working of the Jaws:** The maxillary, premaxillary and the rostral are strongly bound together by fibrous or ligamentous tissues, and the premaxillary is similarly bound to its fellow of the opposite side. The five bones (two maxillaries, the two premaxillaries and the rostral) thus form a compact single piece with little movement between the components. The whole piece forms the upper jaw of the fish and is capable of a certain amount of movement upon the anterior end of the cranium to which it is attached not only by fibrous tissue but also, on each side of the head by the ethmoido-maxillary ligament. This arises on each side of the mesethmoid bone and passes beneath the lachrymal and is attached to the outer face of the anterior end of the maxilla of its side. From the apex of the mesial face of the pointed first anterior ascending process of the premaxillary there arises a stout ligament which passes over to the opposite side lying over the similar process of the premaxilla of the other side, and is inserted on the anterior ascending process of the palatine of the opposite side. This condition recalls that found in the skull of the Haddock (23).

In the closed condition of the mouth, the shanks of the premaxilla and maxilla pass upwards, internal to the lachrymal, and are hidden from view by that bone, its lower edge forming the margin of the upper lip. A slight fold of dermal tissue of the lip extends upwards between the maxillary and the premaxillary. A second fold extending from the hind part of the mandible to very near the anterior end of the snout, lies between the maxillary and the lachrymal. The hind ends of the premaxilla and the maxilla are slightly enlarged and strongly bound together by dermal tissue. When the mouth is closed these hind ends lie in a depression on the outer surface of the lower jaw at its posterior dorsal end. They are also connected to the mandible by strong dermal tissue which pulls them downwards and forwards when the mouth is opened. They are pulled back to position by the same tissues when the mouth is closed, but in addition there is the action of a long tendon of the adductor mandibulæ arising from the lower end of the muscle and inserted on the external face of the maxillary at its ventral edge very near its anterior end.

2. *Second or Hyoid Arch.*

The second or Hyoid arch, like all the other visceral arches, consists of two half-loops united together by a median basihyal. Each half-loop divides into two portions, (1) a dorsal Hyomandibula which ossifies into two bones, a Hyomandibular bone above, articulating with the auditory capsule, and a Symplectic below connected with the quadrate, and (2) a ventral Hyoid Cornu which ossifies into three bones. These are, from above downwards, an Epihyal, a Ceratohyal and a Hypohyal, the last of these being double. The hypohyals of the two sides are united by the median Basihyal or Copula. A small rod-shaped bone, the Stylo-hyal or Inter-hyal lies between the dorsal edge of the epihyal of the Hyoid Cornu and the symplectic of the hyomandibula.

The four dermal opercular bones are connected to the Hyoid arch. There are seven Branchiostegal rays all of them con-

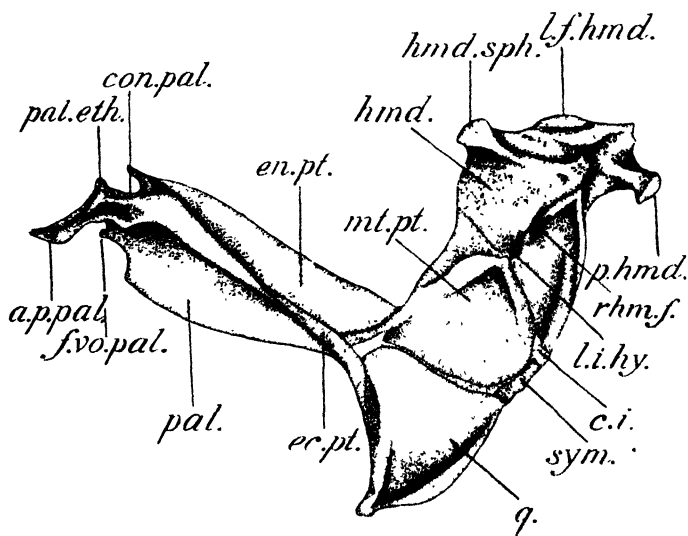


FIG. 15. External view of left hyomandibulo-symplectic and palato-quadrate apparatus (11).

*a.p.pal.*, anterior articulatory process of palatine; *c.i.*, cartilaginous interspace; *con.pal.*, concavity on palatine for ventral ball-like ecto-moidal knob; *ec.pt.*, ecto-ptyergoid; *en.pt.*, ento-ptyergoid; *f.vo.p.*, facet of palatine fitting into lateral corner of vomer; *hmd.*, hyomandibular; *hmd.sph.*, hyomandibular process for articulating with sphenotic depression; *lf.hmd.*, longitudinal facet of hyomandibular for articulation with pterotic; *l.i.hy.*, foramen for ligament from interhyal to sphenotic; *mt.pt.*, meta-ptyergoid; *pal.*, palatine; *pal.eth.*, palatinal facet for glide beneath ect-ethmoidal facet; *p.hmd.*, posterior articulatory process of hyomandibular for operculum; *q.*, quadrate; *rh.m.f.*, foramen for ramus of hyomandibularis facialis; *sym.*, symplectic.

nected to the epihyal and ceratohyal. The median Urohyal or Basi-branchiostegal bone is present and occurs posterior to the basihyal.

The Hyomandibula forms the suspensorium for the two jaws and this condition where the jaws are attached to the skull through the intervention of the hyomandibula is called Hyostylic,<sup>1</sup> a mode of suspension characteristic of all Teleosteans and the majority of the Selachii.

The Hyomandibula results in two ossifications, the Hyomandibular and the Symplectic.

The Hyomandibular (*hmd.*) has an irregular flat body with a posterior ventrally directed, rod-like process. Anteriorly, dorsally, and posteriorly the body of the bone has three articular surfaces. The anterior and posterior ones are ball-like, rounded and situated at the end of small processes from the bone. The anterior process is directed forwards and upwards and the posterior, backwards and downwards. The dorsal articular surface is elongated. All these articular surfaces are capped with cartilage in the fresh condition. The anterior ball-like surface (*hmd.sph.*) fits into the lateral depression on the sphenotic, the dorsal elongated surface (*d.f.hmd.*) into the lateral ventral groove on the pterotic, and the posterior knob (*p.hmd.*) gives articulation to the opercular bone.

The inner face of the bone is smooth while on the outer, there are two well-marked erect ridges. One of these is situated on the posterior ventral process running parallel to it and lying on its posterior edge; the other starts from the middle of the hyomandibular and is directed forwards and downwards making an angle of 45° with the former. The second ridge separates the body of the bone anterior to the postero-ventral process, into two parts. Behind it, on the postero-ventral process there is a deep groove the outer wall of which is formed by the ridge itself. Into this groove fits the dorsal part of the anterior end of the pre-opercular.

About the middle of the anterior edge of the hyomandibular, immediately behind it and also partly covered by it is

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<sup>1</sup> According to Huxley three types of jaw-suspension can be distinguished: In Dipnoi and possibly in the Holocephali, we get the *Autostylic* type where the hyomandibular takes no part in the suspensorium and the quadrate region articulates directly with the auditory region of the skull.

The second type, the *Hyostylic*, is found in the majority of Selachii and in all the Teleostomes. Here the quadrate region is articulated to the skull through the intervention of the hyomandibular.

The third and last type is the *Amphistylic* type, which occurs only among the more primitive Chondrichthyes (Notidani and early Heterodonti among Selachii, Pleuracanthodii, Acanthodii, Cladoselachii). In this case there exists an otic process which serves to connect the quadrate region directly to the skull, and in addition to this the hyomandibular also takes part in the suspension. (Goodrich, 35: Studies on the Structure and Development of Vertebrates, p. 409 *et. seq.*).

a circular opening (*r.hm.f.*) facing downwards and leading into a small canal in the bone, whose other opening is found on the internal face of the bone itself. This canal and opening is for the passage of the ramus hyomandibularis facialis. Slightly anterior to this is another opening (*l.i.hy.*) which faces upwards and leads downwards into a canal which also opens internally. Through this the ligament from the inter-hyal passes and ends on the antero-lateral corner of the sphenotic.

In front of the proximal end of the postero-ventral process of the hyomandibular and near the ventral end of the anterior ridge of the bone, the posterior edge of the metapterygoid sends a process which projects backwards and internal to the hyomandibular. Externally, however, both the hyomandibular and the metapterygoid unite. There is thus a V-shaped recess enclosed internally on the hyomandibular in this region. The dorsal end of this recess terminates in the opening through which the hyomandibularis facialis passes out from internal to the hyomandibular. After this, the nerve divides into two, a slender branch—the hyoideus facialis—entering a small foramen (*r.h.f.*) very near the distal end of the postero-ventral process of the hyomandibular, between it and the anterior edge of the pre-opercular, and a stouter branch—the mandibularis facialis—entering a large foramen (*r.m.f.*) situated ventral to that of the hyoideus facialis, between the symplectic and the pre-opercular.

Dorsally, the hyomandibular adjoins the pterotic and ventrally it unites with the metapterygoid. Its postero-ventral process passes posterior to the metapterygoid and stops a little above the dorsal tip of the symplectic from which it is separated by a strip of cartilage. The process lodges the dorsal half of the anterior edge of the pre-operculum. Internal to the pre-operculum extends the posterior articular process of the hyomandibular which gives articulation to the opercular.

The Symplectic (*sym.*) is a long roughly triangular bone extending from below the base of the postero-ventral process of the hyomandibular to very near the articular surface of the quadrate. Its lower half is situated internal to the quadrate and lies in a corresponding groove on the inner face of that bone.

The base of the triangle is situated above and the apex below. The dorsal half of the bone lies between the posterior edge of the metapterygoid and the margin of the pre-operculum. Dorso-anteriorly the symplectic gives off a small strip of bone with splints at its free edge. This strip passes internal to the metapterygoid and unites with it. Postero-ventrally also there is a longer but narrower strip which secures union with the quadrate. Above the dorsal edge of the symplectic is a small cartilaginous interspace which separates the bone from the end of the postero-ventral process of the hyomandibular. Inter

nally, on the interspace of cartilage is a depression into which fits the dorsal head of the inter-hyal.

Between the dorsal end of the posterior edge of the symplectic and the pre-operculum is a large oval opening which transmits the ramus mandibularis facialis from the outer surface of the hyomandibular to the inner surface of the quadrate.

### 3. *Hyo-branchial Skeleton.*

#### (a) *Hyoid Cornu.*

The Hyoid Cornu. is also called the Hyo-branchial skeleton owing to its close connection with the branchial arches (35).

Each half of the cornu is attached posteriorly to the inner face of the postero-ventral end of the hyomandibular and anteriorly the two halves are united by the median basihyal.

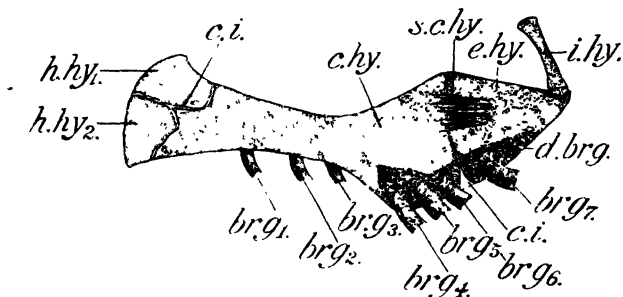


FIG. 16. External view of left half of hyoid cornu. (basi-hyal omitted) (Nat. Size).

*br.g1-7.*, the first to the seventh branchiostegals (heads only shown); *c.i.*, cartilaginous interspace (depressed); *c.hy.*, cerato-hyal; *d.brg.*, depression for attachment of branchiostegals; *e.hy.*, epi-hyal; *h.hy1.*, first hypohyal; *h.hy2.*, second hypohyal; *i.hy.*, inter-hyal; *s.c.hy.*, splints from cerato-hyal for union with epi-hyal.

The four elements that go to make up each half of the cornu are the Epihyal, the Ceratohyal, the paired Hypohyal and the Interhyal; there is then the median Basihyal.

The Epihyal (*e.hy.*) is a triangular bone occurring posterior to the ceratohyal. It is pointed posteriorly and here on the dorsal edge, slightly inwards, is a depression into which fits the proximal end of the interhyal. Anteriorly the epihyal is broad and adjoins the posterior edge of the ceratohyal. Between the ceratohyal and epihyal is a distinct interspace of cartilage whose upper half is interrupted by splints arising from the two bones and uniting with one another. On the inner face the splints are more numerous and the cartilaginous connection is scarcely visible except at its lowest end while on the outer,



the splints invest only the upper half of the cartilage the lower half being clearly visible.

Anteriorly on the lower half of its outer surface, the epihyal has a semi-oval depression which accommodates the head of the posteriormost and largest branchiostegal ray.

The epihyal, according to Allis (3) is also considered as the proximal ossification of the ceratohyal. He considers the epihyal and ceratohyal as one bone with two ossifications, a proximal and a distal.

The Ceratohyal (*c.hy.*) is a long bone, about thrice the length of the epihyal, with a very broad proximal or posterior end and narrowing, first suddenly and then gradually, towards its anterior end. Its posterior edge is curved and united to the anterior edge of the epihyal, while its dorsal and ventral edges are concave. Anteriorly, there is a dorsal indentation on the bone, which gives articulation to the upper hypohyal. The ventral half of the anterior end projects forwards and unites with the lower hypohyal. Postero-laterally, on the lower half of the bone is a small semi-oval depression to which the first six branchiostegal rays are attached by ligaments.

The Hypohyals (*h.hy.*<sub>1</sub>, *h.hy.*<sub>2</sub>) are two in number, a dorsal and a ventral, the former being the longer of the two. Both are triangular in shape with curved anterior edges and the apex pointing backwards. On its dorsal anterior corner the dorsal hypohyal has an articular surface which gives articulation to the posterior end of the basihyal. It is only the dorsal hypohyal that secures union with the basihyal, the ventral hypohyal being bound in the middle line to its fellow of the other side.

Separating the dorsal hypohyal from the ventral and also from the dorsal anterior edge of the ceratohyal is a distinct strip of cartilage. Such a strip does not, however, exist between the ventral hypohyal and the ceratohyal. Splints of bone arising from the hypohyals and the ceratohyal interrupt the cartilaginous lining and unite the bones with one another.

The Interhyal (*i.hy.*)—the Epihyal of Allis, also known as the stylohyal—is a short, rod-shaped bone with a flat dorsal or proximal end which fits into the depression on the cartilaginous interspace between the hyomandibular and the symplectic. Its ventral or distal end is rounded and knobby and fits into the dorso-posterior depression on the epihyal. It lies at right angles to the epihyal and is directed forwards and upwards. On its outer surface it is connected by a ligamentous sheet to the inner surface of the pre-operculum. From its proximal end there arises a ligament which passes through the foramen in the hyomandibular and is inserted on the antero-lateral corner of the sphenotic.

The Basihyal (*b.hy.*) is a thick, oval bone supporting the tongue of the fish. It is completely covered with cartilage in the fresh condition. It has a flat upper surface, a very convex

lower surface and a pointed posterior end which rests upon the dorsal edges of the two upper hypohyals of the two sides, to which it is also connected firmly by means of fibrous tissue.

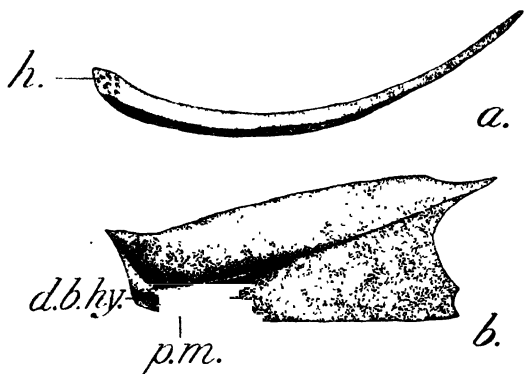


FIG. 17.

*a*, A branchiostegal bone ( $\times 1\frac{1}{2}$ ). *b*, The Uro-hyal or Basi-branchiostegal bone ( $\times 2$ ).

*d.b.hy.*, depression for insertion of ligament from basi-hyal; *h.*, head of branchiostegal for attachment to cornu; *p.m.*, point of insertion of muscles from pectoral girdle.

Connected with the hyoid cornu are two more bones which may be dealt with here. They are, the Branchiostegals and the Urohyal or Basibranchiostegal, the latter not directly connected to the hyoid cornu but only by ligaments and occurring between the two cornual halves.

The Branchiostegals (*brg.*), which are also called the Branchiostegal rays or Branchiosts, are seven in number, the first six attached proximally by their bases to the ventral edge of the ceratohyal and the seventh to the ventral edge of the epihyal. They are all free distally and connecting all of them is a piece of the skin which forms a fold ventro-mesially along the ventral edge of the operculum. Each ray is laterally compressed with a flat enlarged base and curved downwards and backwards. It tapers to a point posteriorly, and possesses an ill-formed wing along its anterior edge. The most dorsal branchiostegal which is also the posteriormost ray is the longest and the rays decrease in length as we proceed anteriorwards.

The two most dorsal rays lie, in the fresh condition, internal to the inter-operculum, the next anterior one lies along and parallel to the ventral edge of that bone and the remaining four rays lie on the outside, mesial to the opercular edge.

The Urohyal (*fig. 17.B.*)—the Sternum of Allis—or the Basibranchiostegal is a roughly triangular bone lying in the

mid-ventral line between the two halves of the hyoid cornu, with a thick anterior edge, a straight dorsal edge and a slightly convex ventral edge. Starting from the ventral end of its anterior edge are two lateral laminae, one running along the ventral margin up to about half its length and the other running backwards and upwards and ending at the dorso-posterior corner of the bone. The posterior ventral end of the bone gives insertion to ligaments that connect it to the ventral part of the anterior ends of the cleithra. From each side of its anterior end originates a ligament which is inserted on the outer lower corner of the ventral hypohyal of its side.

The Urohyal lies between the sternohyoid muscles. 'It is peculiar to the Teleostei and is generally considered to be an ossification of the median ligament' (35).

In close association with the Hyoid arch are the dermal bones that support the operculum. These are, the Pre-opercular, the Opercular, the Inter-opercular and the Sub-opercular.

The Pre-opercular (*p.op.*) is a crescent-shaped bone with a concave anterior edge, the concavity being directed forwards and upwards, and a convex posterior edge. The anterior edge is slightly folded on itself, the fold being external so that there is an anterior channel-like groove extending throughout that edge of the bone. Both the dorsal and the ventral ends of the bone are pointed. The dorsal half of the anterior edge lies in the groove at the posterior edge of the hyomandibular and its pointed tip extends slightly beyond the dorsal end of the groove. The ventral part of its anterior edge lies in the groove on the posterior edge of the quadrate, its pointed ventral end reaching right up to the articular surface on that bone. A small part of its anterior edge (at about the middle of its length) adjoins the interspace of cartilage between the hyomandibular and the symplectic.

The folded anterior edge forms an external flange from whose free edge five small processes of bone originate at definite distances from each other. These processes are directed backwards and downwards and their distal ends are united to the body of the pre-operculum, so that they look like definite arches arranged in a radiating manner on the bone. Passing through these arches and situated in the anterior groove of the pre-operculum is the pre-opercular lateral line canal.

On its inner surface anteriorly, slightly behind the middle of its anterior edge, the pre-operculum has a slight oval eminence which lodges in a small depression on the posterior end of the external face of the inter-operculum.

The posterior edge of the pre-operculum is markedly convex, its middle portion being bluntly pointed. The whole edge except its very dorsal part is finely serrated and into these serrations run ray-like lines starting from the middle of the bone.

The dorsal part of the posterior edge, above the bend, lies external to the anterior edge of the opercular. The ventral part is almost horizontal and is parallel and external to the ventral edge of the inter-opercular.

The Inter-opercular (*int.op.*) is a thick roughly oval bone lying internal to the lower half of the pre-opercular, with a posterior end that is broader than the pointed anterior end. Its dorsal edge is more or less straight, while its ventral edge is convex and possesses fine indentations on it with ray-like lines running into them. On the inner surface of its dorsal edge very near the posterior end, is a depression with a slight eminence behind it. The depression lodges the posterior end of the epihyal. The pointed anterior end of the bone is attached by ligaments to the mandibula.

The ventral edge of the inter-operculum is also united to the piece of skin which extends between all the branchiostegals and is folded in the natural condition, each fold having a branchiostegal for its axis. The two dorsalmost folds and consequently the two dorsalmost branchiostegals also, lie internal to the inter-operculum. The remaining folds are closely pressed against each other and lie mesial to the interopercular margin. The fold also narrows anteriorly according to the length of the branchiostegals, the anterior ones of which grow shorter.

The Opercular (*op.*) is a laminate, irregularly triangular bone with the apex situated antero-dorsally. This apex is thick and possesses, slightly internally, a deep socket which faces inwards and upwards and articulates with the hyomandibular. Starting from the base of the socket are two strong ridges, one of which is dorsally situated and bifurcates a little beyond its origin, the bifurcations running backwards and downwards at an angle of 25° to each other and ending in spine-like points. The second ridge which is thicker, is directed downwards and slightly backwards and forms the anterior edge of the opercular. That edge of the bone connecting the ends of these ridges is deeply concave and the ventral of the two concave edges is longer and overlaps the whole dorsal edge of the sub-opercular.

The anterior edge of the opercular is overlapped by the dorsal part of the posterior edge of the pre-opercular and also by the posterior edge of the process of the sub-opercular.

Dorso-posterior to the articulatory depression of the opercular, on the inner surface of the bone, above the origin of the first opercular ridge, is a small depression for the insertion of the levator operculii.

The Sub-opercular (*s.op.*) is a thin, leafy bone roughly oval in shape, pointed posteriorly and blunt anteriorly where it has a process with a sharp tip directed upwards and slightly forwards, and overlapped in front by the pre-opercular. The ventral edge is straight while the dorsal, which is convex, is

overlapped by the ventral edge of the operculum to which it is attached by fibrous tissue.

(b) *Branchial Arches.*

Out of the seven visceral arches, the modification and final fate of the first two have been described already. Of the remaining five, the first four support the pharyngeal wall and form a frame-work for the gills and the fifth or the last arch persists only in part as a single bone on each side, the inferior pharyngeal bone, bearing sharp teeth serving mastication.

Each branchial arch is made up of two pieces united in the mid-ventral line by the basi-branchial bone; and each half of an arch consists of four pieces; a dorsal Pharyngo-branchial, a dorsal Epibranchial, a lateral Ceratobranchial and a ventral Hypobranchial. The hypobranchials of the two sides are connected in the mid-ventral line by the median Basibranchial.



FIG. 18. Dorsal view of the Branchial Arches (Nat. Size.)  
(Slightly pulled out for the sake of clarity).

*b.hy.*, basi-hyal; *b.br1-4.*, the first, second, third and fourth basi-branchials; *c.br1-4.*, the first, second, third and fourth cerato-branchials; *c.br5.*, the fifth cerato-branchial or inferior pharyngeal bone; *c.hy.*, cerato-hyal; *e.br1-4.*, the first, second, third and fourth epi-branchials; *h.br1-4.*, the first, second, third and fourth hypo-branchials; *h.hy1-2.*, the two hypo-hyals; *ph.br1-4.*, the first, second, third and fourth pharyngo-branchials; *s.ph.br.*, the first supra-pharyngo-branchial.

In *Otolithus* all the four branchial arches and the inferior pharyngeal bones are present and well-ossified. The first arch contains all the pieces and in addition, a small dorsal cartilaginous piece—the Supra Pharyngobranchial—; and the first basibranchial is cartilaginous. The second and third arches are

also complete in possessing all the elements. In the fourth arch the basibranchial is absent as also the hypobranchial ; but there is a median piece of cartilage existing behind the third basibranchial. A similar piece found in the same place in the branchial skeleton of *Scomber* by Allis (3) has been called by him the fused unossified hypobranchials of the fourth arch. The fifth arch is represented by the ceratobranchials which are transformed into the Inferior pharyngeal bones.

**The Basibranchials :** The First Basibranchial (*b.br<sub>1</sub>*.) is a thick piece of cartilage occurring between the hypohyals and lying ventral to the posterior part of the basihyal. It is more or less triangular in shape with a blunt tip which is bent downwards. Posteriorly it is immovably connected to the second basibranchial. Ventrally its posterior edge is in apposition on either side with the ventral part of the articular head of the first hypobranchial.

The Second Basibranchial (*b.br<sub>2</sub>*.) is a thick, well-ossified, roughly triangular bone, longer than the first and united to its hind edge. Its broad posterior edge is fused with the third basibranchial by synchondrosis. Laterally in its anterior half it has on each side a deep concavity into which the head of the first hypobranchial fits. This concavity is long and extends forwards upto the postero-ventral edge of the first basibranchial. Behind this facet the bone is broad. Its dorsal surface is flat but the ventral surface is slightly concave. Ventrally the lateral part of its posterior edge adjoins the lower part of the articular head of the second hypobranchial. No clear interspace of cartilage exists between the first and second basibranchials or between the second basibranchial and the head of the first hypobranchial.

The Third Basibranchial (*b.br<sub>3</sub>*.) is the longest, nearly twice as long as the second with a concave ventral surface. Its outline is like that of an urn with a convex anterior edge, the neck of the urn being formed by two lateral depressions behind which the bone broadens out undergoing a sudden narrowing to a point posteriorly and imperceptibly merging into the piece of cartilage—the so-called fused fourth hypobranchials. In front it fits into the hind edge of the second basibranchial without the intermediation of any cartilage.

Into the anterior lateral depressions fit the articular heads of the second hypobranchials. The posterior part of the basibranchial is embraced, as it were, by the two hypobranchials of the third arch and is thereby hidden from view.

The Fourth Basibranchial (*b.br<sub>4</sub>*.) : Beyond the third basibranchial there is no other ossified, basibranchial element. But in front of the closely apposed anterior ends of the inferior pharyngeal bones and occupying the angle formed by the fourth ceratobranchials, is a very small piece of cartilage similar to the one observed by Allis (3) in *Scomber*, and called by him the unossified fourth, basibranchial.

The Hypobranchials: All the first four arches possess hypobranchials, the fourth pair, however, being unossified.

The First Hypobranchial (*h.br<sub>1</sub>*.) consists of a semi-cylindrical, rod-like shank and an anterior articular head which fits into the lateral depression on the second basibranchial. Ventrally, from the head, there is a short blunt process directed mesially and passing beneath the second basibranchial and almost meeting its fellow of the opposite side in the mid-ventral line. The anterior end of the process also touches the postero-ventral part of the first basibranchial.

The shank of the bone is directed backwards and slightly outwards at an angle of about 120° with the head. It is of uniform thickness and has a shallow groove for the accommodation of the branchial blood vessel. The posterior end of the shank is capped with cartilage and articulates with the anterior end of the first ceratobranchial.

The Second Hypobranchial (*h.br<sub>2</sub>*.) is just like the first but with a shorter shank. Both the articular head and its ventral process are shorter and broader; in fact, the latter process is so short that it ceases to be a process at all. The head is lodged in the lateral depression on the anterior part of the third basibranchial. The ill-defined ventral process is directed anteriorly and adjoins the postero-lateral edge of the second basibranchial. Between the ventral parts of the two articular heads there is a small gap through which the truncus arteriosus passes.

The shank possesses a ventral groove which is deeper than on the first hypobranchial. The posterior end of the shank, which is furnished with a cartilaginous cap, articulates with the anterior end of the second ceratobranchial.

The Third Hypobranchial (*h.br<sub>3</sub>*.) is a flat elongated bone with its anterior half bent ventrally. Its posterior edge is convex and the two hypobranchials touch each other at a point posteriorly in the middle line. From this point they diverge anteriorly and thus enclose between them a triangular space into which enters the posterior half of the third basibranchial. The anterior half of each third hypobranchial bends ventrally and then inwards, but the two halves do not meet in the mid-ventral line. Thus they almost completely enclose a space through which the truncus passes. The posterior convex edge is lined with cartilage and unites with the anterior end of the third ceratobranchial. It also forms the anterior boundary for the cartilaginous strip (the fourth hypobranchial of Allis) occurring posterior to it. Mesially, each third hypobranchial is united to the lateral margin of the posterior part of the third basibranchial.

The Fourth Hypobranchial (*h.br<sub>4</sub>*.) is not distinctly present but posterior to the third hypobranchials and in the angle formed by the third ceratobranchials is a parallelogram-like cartila-

ginous strip which gives articulation to the fourth ceratobranchials postero-mesially. A similar strip of cartilage found in *Scomber* has been termed by Allis (3) as the fourth hypobranchial. This cartilaginous strip is also in union anteriorly with the third basibranchial.

The Ceratobranchials (*c.br.*<sub>1-4</sub>): The four ceratobranchials are all of them alike in structure. Each is elongated and slightly bent, the hollow of the bend being oral. It is cylindrical but has a deep groove running throughout its length. Both the ends of the ceratobranchial are capped with cartilage. The anterior end of each unites with the posterior end of its own hypobranchials: the anterior end of the fourth ceratobranchial merely abuts against the cartilaginous strip already referred to as the fourth hypobranchial. It is broad and flattened and the mesial edges of the two anterior ends of the pair meet in the middle line behind the cartilaginous strip.

The posterior end of each ceratobranchial articulates with the epibranchial of its own arch. The third and fourth ceratobranchials are slightly more bent than the second. There is a triangular scoop in the antero-mesial part of the fourth ceratobranchial.

The Fifth Ceratobranchial or the Inferior Pharyngeal bone (*c.br.*<sub>5</sub>) is the only representative in the adult fish of the fifth branchial arch. This is a doubly curved rod with a flat mesial dentulous process extending from its anterior end to about three-fourths of its entire length. The mesial edge of the process is convex.

The united anterior ends of the two inferior pharyngeal bones lie in contact with the posterior part of the cartilaginous fourth hypobranchial, while behind, the bones are narrow and diverge from each other.

The mesial processes which, in their anterior halves, lie closely in apposition in the middle line, bear on their concave dorsal surfaces numerous teeth of various sizes with no definite arrangement.

This toothed mesial plate of the inferior pharyngeal bone working against the dentulous, united, ventral parts of the pharyngobranchials of the first four arches, forms a very good masticatory apparatus for the fish.

The Epibranchials: As stated before, only the first four arches bear epibranchials, the last one being devoid of them. All the epibranchials are long, though not so long as the ceratobranchials. One end of an epibranchial is united to the posterior end of the ceratobranchial of its own arch and the other end is directed mesially and bears the respective pharyngobranchial. The ends of the epibranchials are capped with cartilage.

The First Epibranchial (*e.br.*<sub>1</sub>) is a long cylindrical bone, slightly flattened and curved, the hollow of the curve being postero-mesial. It has a deep groove on its dorsal side, and



from about the middle of its length there arises a mesial, flattened, roughly triangular process. The anterior end unites with the first pharyngobranchial, the apex of the triangular mesial process bears the Supra-pharyngobranchial of the first arch and the posterior end unites with the first ceratobranchial.

The Second Epibranchial (*eb.br<sub>2</sub>*) resembles the first in all respects except that it is a bit more bent and has its anterior end flattened out to a small extent. It also possesses the mesial process which however, does not carry any supra-pharyngobranchial element since the latter is absent in the second and subsequent arches. The posterior end unites with the second ceratobranchial and the anterior rests on the centre of the flattened second pharyngobranchial. The dorsal groove on the bone is deeper in this case.

The Third Epibranchial (*eb.br<sub>3</sub>*) is similar to the two previous epibranchials but is shorter and has a broad anterior end. The mesial process, however, is bigger and broader and arises from the posterior half of the bone. It is directed dorsally as usual with its apex bent slightly backwards and in close apposition with the anterior face of the mesial process of the fourth epibranchial. The dorsal groove is very shallow here.

The Fourth Epibranchial (*eb.br<sub>4</sub>*) is as long as the third but bent like the second with the mesial process running the entire length of the bone almost obscuring the body. Consequently there is no dorsal groove, the margin of the blade being dorsal. The anterior end is pointed and lies in a depression in the body of the fourth pharyngobranchial. The third and fourth epibranchials are so much in apposition that they appear as one single structure.

**The Pharyngobranchials:** There are four pharyngobranchials, one for each of the first four arches. Each is different from the other in shape, size and structure. The third and the fourth and, to a small extent, the second also, bear teeth on their ventral surfaces. All three of them are very closely attached to one another and they form an almost united toothed structure corresponding to the inferior pharyngeal bone. They are all united together by a fleshy muscular sheet and lie *en masse* beneath the auditory capsules attached by ligaments to the ventral surface of the pro-otics.

The First Pharyngobranchial (*ph.br<sub>1</sub>*) is a tiny cylindrical rod of bone attached to the anterior end of the first epibranchial.

The Second Pharyngobranchial (*ph.br<sub>2</sub>*) is a flat triangular bone situated dorsally and connected, at about the middle of its length, to the second epibranchial. Its anterior end is free and posteriorly and mesially it is united to the lateral edge of the third pharyngobranchial. Its antero-dorsal corner gives union to the posterior end of the supra-pharyngobranchial of the first arch. Ventrally a tiny strip of its posterior corner

has an irregular row of minute teeth arranged on it, the rest of its ventral surface being smooth.

The Third Pharyngobranchial (*ph.br<sub>3</sub>*) is the largest of all the pharyngobranchials. It is roughly rectangular in shape, the two long sides of the rectangle being concave, and has a large depression on its dorsal surface. The third epibranchial unites with it at its postero-dorsal corner. Its whole lateral edge adjoins and is united with the mesial edge of the second pharyngobranchial. Its mesial edge is free but its posterior edge gives articulation to the anterior edge of the fourth pharyngobranchial.

On the ventral surface, the posterior half of the bone bears numerous backwardly directed teeth arranged very irregularly. Posteriorly, just mesial to the depression which lodges the end of the third epibranchial, is a shallower depression accommodating the anterior end of the fourth epibranchial.

The third and fourth pharyngobranchials are very closely united to each other but they are easily separable without any damage to either of them.

The Fourth Pharyngobranchial (*ph.br<sub>4</sub>*) is an irregular bone looking massive but really almost hollow. There is a large postero-dorsal U-shaped concavity with the hollow of the U directed mesially. The anterior edge of the bone is united to the posterior edge of the third pharyngobranchial and the antero-dorsal corner accommodates the ventral part of the anterior end of the fourth epibranchial. Posteriorly on the margin of the U-shaped concavity, restricted to the bend of the U, are found six ridges. These are rough and have been found to be constant in number in all the specimens examined.

The whole ventral surface of the bone bears teeth. Those on the anterior third of the bone are large, sharp and backwardly directed; the rest are uniformly small, not clearly visible to the naked eye and giving a rough feel to that part of the bone on which they occur.

The First Supra-Pharyngobranchial (*s.ph.br.*): On the first branchial arch, arising from the apex of the triangular mesial process of the first epibranchial, is a backwardly directed curved rod of cartilage. A similar piece of cartilage found in an identical position in the branchial skeleton of *Scomber* has been termed by Allis (3), the Supra-Pharyngobranchial. This piece of cartilage in *Otolithus* goes backwards and unites with the second pharyngobranchial on its antero-lateral corner.

The Gill-rakers and the Gill-filaments: The gill-rakers are small structures found arranged on the sides of the hypo-, epi-, and cerato-branchials of the first four branchial arches. They are rough to the touch and serve as a sieve in impeding the escape of food matter found in the water taken into the branchial chamber. Any food that may be obtained this way is retained in the pharynx and is swallowed by the fish.

The gill-rakers on the outer face of the first arch are elongated pointed structures directed forwards and upwards, while those on the inside of the first arch and on both the faces of all the other arches are small, circular, flat structures with microscopic teeth on them.

The number of gill-rakers on each bone of each arch was found to be constant in more than ten specimens. A table is given below showing the number of rakers on each of the hypo-, epi- and cerato-branchials of the four arches.

Table showing the number of Gill-rakers occurring on each component of the Branchial arches.

		I	II	III	IV	V
Hypo-branchials	Outside	3	3	3	0	0
	Inside	4	3	0	0	0
Cerato-branchials	Outside	9	7	8	8	0
	Inside	7	7	8	8	0
Epi-branchials	Outside	5	4*	3	2	0
	Inside	3	4*	3	2	0

\* On the second epi-branchial an extra small raker is found in some cases on both sides.

The gill-rakers are purely dermal elements and are in no way fused to the arches on which they occur. In large specimens the position of the raker is indicated by the presence of a very faint elevation on the arch.

The Gill-filaments are very slender ray-like structures arranged in two rows on each arch, one row on each side of the ventral depression on the arch which lodges the branchial blood vessel. The bases of all the filaments are fused together. The gill filaments are found on the hypo-, epi-, and cerato-branchials of each arch. They will be dealt with in greater detail under the Branchial System.

### (B) *Vertebral Column.*

The Vertebral Column is composed of twenty five vertebrae which are not all alike in size or structure. It can be divided into two regions: (1) An anterior Trunk Region consisting of the first eleven vertebrae, each trunk vertebra being characterised by the possession of movable ribs, one pair on each vertebra, and (2) A posterior Caudal Region composed

of the remaining fourteen vertebræ, each of which possesses a well-developed hæmal arch and hæmal spine.

The centra of all the vertebræ are well-developed and ossified and are typically Amphicoelous. There is thus enclosed between any two vertebræ a roughly spherical space filled with notochordal tissue in the living condition. The notochord is also present as a thin strand in the notochordal canal which perforates the body of the centrum.

On the centrum of every vertebra are found certain depressions which in the fresh condition are filled with muscles and fat. As a result of the formation of these depressions ridges are formed on the body of the centrum. These ridges have been called Strengthening Ridges (Cole & Johnstone, 24).

The vertebræ also possess articulatory surfaces namely the Prezygapophyses and the Postzygapophyses. These are always dorsal in position and arise from the base of the neural arch, the prezygapophyses anteriorly and the postzygapophyses posteriorly. The prezygapophyses of one vertebra articulate with the postzygapophyses of the preceding vertebra. The zygapophyses of the first four trunk vertebræ are not well defined.

The disposition of the neural spines of the vertebræ is as follows: erect in vertebræ 1 and 2 and inclined posteriorwards from vertebra 3 onwards, the inclination being slight at first and more marked posteriorly. The neural spines of vertebræ II to VIII are thick, broad and strong, while beyond vertebra VIII they are longer, thinner and flexible. They increase in length gradually till vertebra XIII beyond which they are of the same length in vertebræ XIV, XV and XVI; from vertebra XVII there is a gradual decrease in length. The parapophyses are developed in the last six trunk vertebræ *i.e.* from trunk vertebræ VI to XI (inclusive). They are small and rudimentary in the

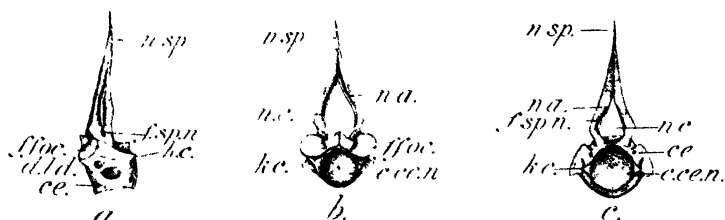


FIG. 19. The Atlas or first vertebra ( $\times 1\frac{1}{2}$ ).

a. Side view ; b. Anterior view ; c. Posterior view.

*c.c.n.*, concavity of centrum filled with notochordal tissue ; *ce.*, centrum ; *d.l.d.*, dorso-lateral depression ; *f.f.oc.*, facet on atlas for articulation with ex-occipital facet ; *f.sp.n.*, foramen for spinal nerve ; *k.c.*, lateral knob on centrum ; *n.a.*, neural arch ; *n.c.*, neural canal ; *n.sp.*, neural spine.

sixth vertebra and show progressive development till the eleventh vertebra. They are always situated at the antero-ventral end of the centra. Except those of the sixth vertebra all the other parapophyses bear movable ribs at their free distal end. There is a pair of ribs for each vertebra, one on each parapophysis. In vertebrae I to VI the ribs are attached to the centra. There is a small thin bridge of bone connecting the two parapophyses of vertebrae IX, X and XI, that on the eleventh being broad and well developed.

The twelfth vertebra is the first caudal vertebra, for it is only here that the movable ribs cease to be present and the hæmal canal and spine are first formed in their entirety.

### 1. *The Trunk Vertebrae.*

A Typical Trunk Vertebra (*e.g.* Vertebra VII). There is a well-developed broad centrum typically amphicoelous, the two concavities being rather deep and communicating with each other through a narrow and minute notochordal canal which perforates the body of the centrum and persists even in the adult. In the live condition the inter-central spaces as also the notochordal canal are filled with notochordal tissue, so that the notochord is not completely lost in the adult fish.

The mid-dorsal depression on the centrum, said to be present in the vertebra of some teleostean fishes is not markedly developed here. But the mid-ventral depression is present and well-developed. On each side of the body of the centrum, laterally, there is a pair of depressions—the Dorso-lateral (*d.l.d.*) and the Ventro-lateral (*v.l.d.*). From the lateral margins of the ill-developed dorsal depression of the centrum arises a pair of processes obliquely pointing backwards, which unite dorsally to form the neural arch enclosing the neural canal through which the spinal cord passes. The neural arch (*n.a.*) is produced into a dorsal backwardly directed neural spine (*n.sp.*). The bases of the neural arch are broad and from their anterior ends is given off a pair of anteriorly and upwardly directed processes, the Prezygapophyses (*pr.z.*); there are also corresponding processes arising from the posterior ends of the bases; these are smaller and form the Postzygapophyses (*pt.z.*). The prezygapophyses are inclined forwards and upwards while the postzygapophyses point backwards and upwards. As already stated, the prezygapophyses of one vertebra articulate with the postzygapophyses of the preceding vertebra.

Arising from the anterior ends of the lateral borders of the mid-ventral groove is a pair of processes, the parapophyses (*p.p.*) one on each side. They point backwards and outwards, and to the distal end of each is attached by ligaments, a pleural rib.

On the bases of the neural arch there is on each side a pair of foramina (*f.sp.n.*) for the passage of the two roots of the spinal nerve.

There are eleven trunk vertebrae each with a well-developed centrum, a neural arch, and a spine. All but the first five bear parapophyses. The zygapophyses present in all of them are developed to a varying degree in each.

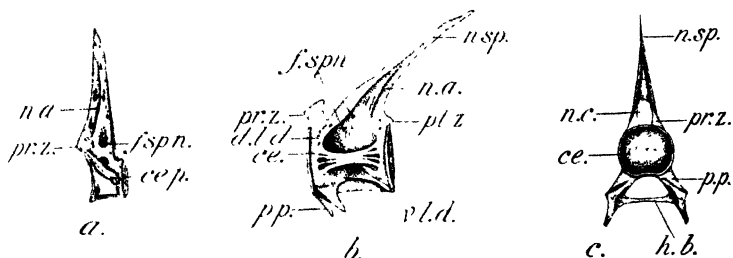


FIG. 20. Three trunk vertebrae ( $\times 11$ ).

*a*, Side view of second trunk vertebra; *b*, Side view of seventh trunk vertebra (typical); *c*, Anterior view of last trunk vertebra.

*ce.*, centrum; *ce.p.*, posterior part of centrum; *d.l.d.*, dorso-lateral depression; *f.sp.n.*, foramina for roots of spinal nerve; *h.b.*, horizontal bony connection; *n.a.*, neural arch; *n.c.*, neural canal; *n.sp.*, neural spine; *p.p.*, parapophysis; *pr.z.*, pre-zygapophysis; *pz.*, post-zygapophysis; *v.l.d.*, ventro-lateral depression.

Vertebra I has a broad centrum which is compressed antero-posteriorly, and a thick broad neural arch with a well-formed neural spine. Both the arch and the spine are erect, and the former springs up only from the anterior half of the centrum. Anteriorly, at the base of the neural arch, on each side of the centrum, is a definite well-marked flat oval surface which glides beneath the ex-occipital facet of its side at the hind end of the skull. At the junction between the body of the centrum and the base of the neural arch on each side, there is a small depression which lodges the head of the first rib. Posteriorly, from either side of the centrum a small lateral knobby eminence projects out.

Of the lateral depressions on the centrum, the dorso-lateral one is deep while the ventro-lateral is superficial and shallow. A median ventral depression is also absent. The first pair of ribs is short and bent outwards and backwards.

Vertebra II has a centrum which is more compressed than in the first vertebra. The neural arch is broad, thick, and vertical with its tip slightly curved to the front. It bears the ill-defined prezygapophyses which overlap the major part of the centrum of the first vertebra, and has at its base on each side a pair of foramina for the passage of the spinal nerve. The

breadth of the base of the neural arch exceeds that of the centrum and therefore, a part of it projects anteriorly beyond the centrum, thus indicating an ill-formed prezygapophysis. In a side view, therefore, the centrum appears pushed backwards. The posterior lateral knobby eminences found on the first vertebra are also present here and are better developed, projecting more on the sides. Articulation for the ribs is provided for as in the first vertebra, on the centrum at the junction between it and the base of the neural arch. Owing to the great compression of the centrum, the depressions are not very clear. The ribs are short and directed backwards and outwards.

Vertebra III has again a compressed centrum and a well-developed neural arch and spine, the latter fairly long and inclined backwards. The prezygapophyses are better formed than in the previous cases, projecting in front of the centrum and resting on the centrum of the second vertebra. The mid-ventral depression is shallow and its margins slightly project both anteriorly and posteriorly, suggesting the presence of rudimentary antero-ventral and postero-ventral processes. The dorso-lateral and ventro-lateral depressions are clearly present, the latter being deeper in its anterior end to accommodate the rib.

Vertebra IV has a large centrum and a strong neural arch, and a spine. The latter is inclined posteriorly and is longer than that of vertebra III. The prezygapophyses are fully formed, while the postzygapophyses are rudimentary. The ventro-lateral depression is deep specially at its anterior end where it lodges the head of the fourth rib. The ventro-median depression is fairly deep and its borders form small projections anteriorly and posteriorly as in the previous case.

Vertebra V has a longer centrum than vertebra IV. The neural arch and spine are broad and thick; the latter is inclined posteriorly. Both the pre- and post-zygapophyses are well-defined. The dorso- and ventro-lateral depressions are deep, the latter lodging at its deeper anterior end the head of the rib. The mid-ventral depression is deep, but there are no indications of antero-ventral or postero-ventral processes.

Vertebra VI is similar to vertebra V and possesses a long centrum, and well-developed neural arch and spine and zygapophyses. The parapophyses, appearing here for the first time, are short and directed outwards, situated at the anterior ventral end of the centrum. The ribs are attached to the ventro-lateral depression as usual. Ventral median depression is quite deep, and antero-ventral and postero-ventral processes are absent.

Vertebrae VII and VIII conform to the type described.

Vertebra IX is much like vertebrae VII and VIII except that the neural spine is longer and more slender. The two parapophyses which are longer here, are connected by a thin bridge of bone, giving rise to a canal.

Vertebra X is similar to vertebra IX but with a longer neural spine. The bridge connecting the two parapophyses is better developed. The ribs are very long and directed backwards, their tips reaching up to the second caudal vertebra.

Vertebra XI is the last trunk vertebra. The parapophyses are broad and long and the connecting bridge exists; a large canal is formed in this case. The neural spine is longer and more slender than in the previous vertebra; the mid-ventral depression is broad and deep and the long ribs are directed outwards, backwards and downwards.

## 2. The Caudal Vertebrae.

There is much less variation among the vertebrae of the caudal region than among the trunk vertebrae. This region consists of fourteen vertebrae all of them alike but differing in the length of the neural and haemal spines. The spines of the last caudal vertebra are flattened sideways and form the epural and hypural bones respectively. In all cases haemal spines are directed backwards and lie almost parallel to the vertebral column.

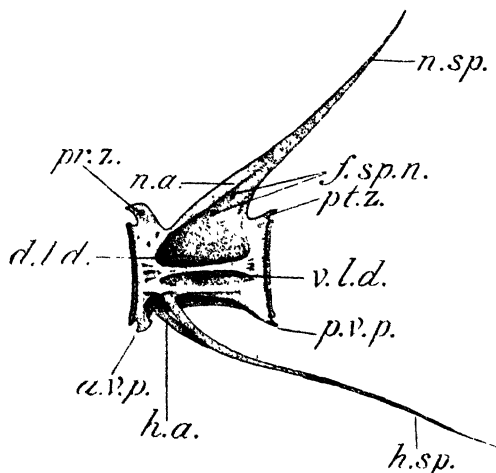


FIG. 21. A typical caudal vertebra ( $\times 2$ ).

*a.v.p.*, antero-ventral process; *d.l.d.*, dorso-lateral depression; *f.sp.n.*, foramina for roots of spinal nerve; *h.a.*, haemal arch; *h.sp.*, haemal spine; *n.a.*, neural arch; *n.sp.*, neural spine; *pr.z.*, pre-zygapophysis; *pt.z.*, post-zygapophysis; *p.v.p.*, postero-ventral process; *v.l.d.*, ventro-lateral depression.

**A Typical Caudal Vertebra.** The centrum is very well developed and long, nearly one-and-a-half times as long as that of any trunk vertebra, with clear, well-formed, dorso-lateral



and ventro-lateral depressions. The medium ventral depression is broad and deep. The neural and hæmal spines are long and directed backwards, the length of the former being about three-fourths that of the latter. The pre- and post-zygapophyses are both fully developed. The bases of the hæmal arch do not extend the whole length of the centrum, like the neural arch, but are restricted to the anterior third of it. The hæmal as well as the neural spines are grooved on the anterior and posterior faces. These grooves serve for the attachment of the sheet of ligament that connects successive spines.

Ventrally, at the anterior end, from the base of the hæmal arch spring two processes, the antero-ventral processes (*a.v.p.*), directed anteriorwards. There are similar processes, the postero-ventral processes (*p.v.p.*), on the posterior side also. The antero-ventral and postero-ventral processes of any two successive vertebrae lie merely in apposition with each other, there being no articulation between them. As in the trunk vertebra a pair

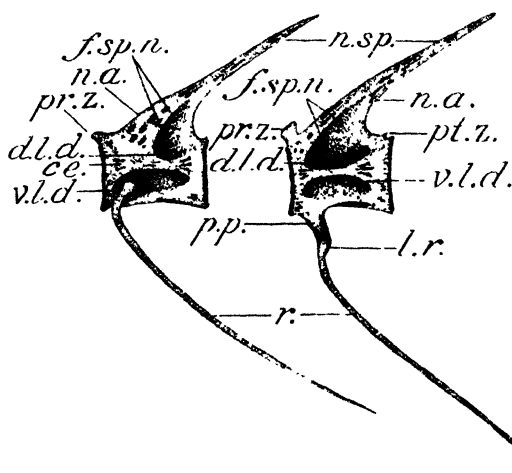


FIG. 22. Side view of two trunk vertebrae to show attachment of ribs ( $\times 2$ ).

*ce.*, centrum; *d.l.d.*, dorso-lateral depression; *f.sp.n.*, foramen for roots of spinal nerve; *l.r.*, ligament connecting rib to parapophysis; *n.a.*, neural arch; *n.sp.*, neural spine; *p.p.*, parapophysis; *pr.z.*, pre-zygapophysis; *pt.z.*, post-zygapophysis; *r.*, rib; *v.l.d.*, ventro-lateral depression of foramina is found on each side at the base of the neural arch for the passage of the spinal nerves.

The First Caudal Vertebra which is the twelfth vertebra of the whole series marks the commencement of the caudal region. It shows the typical condition with a broad hæmal arch but a short hæmal spine directed posteriorly almost parallel with the vertebral column. The antero-ventral processes are rudimentary but the postero-ventrals are fully formed.

Caudal Vertebra II to XII are all alike in structure. But in the twelfth caudal vertebra the neural and hæmal canals are narrow and the spines are blunt and reach the base of the caudal fin. They do not, however, take part in the support of any of the fin rays.

Caudal Vertebra XIII has a short centrum with the neural and hæmal canals occluded with bony matter. The neural and hæmal spines are flattened sideways with broad distal ends and contribute to the support of the caudal fin-rays thus forming the epural and hypural bones. Zygapophyses and ventral processes are completely absent.

The Last Caudal Vertebra is much modified in structure and it takes such a great part in the support and formation of the caudal fin that it is described along with the caudal fin skeleton.

### (C) *The Ribs.*

There are eleven pairs of Pleural ribs attached to the vertebral column proximally and lying between the muscles and the peritoneum. The first six pairs are attached to the centra of the first six vertebræ, one pair on each vertebra. The ventro-lateral depressions on these trunk vertebræ are particularly deep at their anterior ends where the head of the rib is lodged. The remaining five pairs are attached to the distal ends of the parapophyses of the other five vertebræ.

The first five pairs of ribs are short and thin, while the posterior six pairs are very long and thick. The head of each rib is condensed and well-ossified and is attached by ligaments either to the centrum or to the parapophysis. Each rib is directed outwards, slightly backwards and downwards.

In addition to these pleural ribs, all the trunk vertebræ except the last, possess 'upper ribs' ('opipleurals') which occur in the horizontal septum. These 'upper ribs' are attached to the vertebræ along with the pleural ribs. They are more slender than the latter and point outwards, downwards and backwards.

### (D) *The Skeleton of the Median Fins.*

The Dorsal, the Anal and the Caudal Fins form the Median Fins of the fish, since they are unpaired and occur on the median line of the body. The first two are built on the same plan and are of the same structure: the last differs from them, both in the plan of its build and the supporting structures.

#### 1. *The Dorsal Fins.*

There are two Dorsal fins, a short anterior and a long posterior. The skeleton of both the dorsals and also the anal

fins is composed of two sets of structures and they are : (1) a regular series of bony rod-like Radials or Somactidia, endoskeletal in origin and arranged parallel to one another ; and (2) the Fin-rays or Dermotrichia<sup>1</sup> which are dermal in origin and which support the fin.

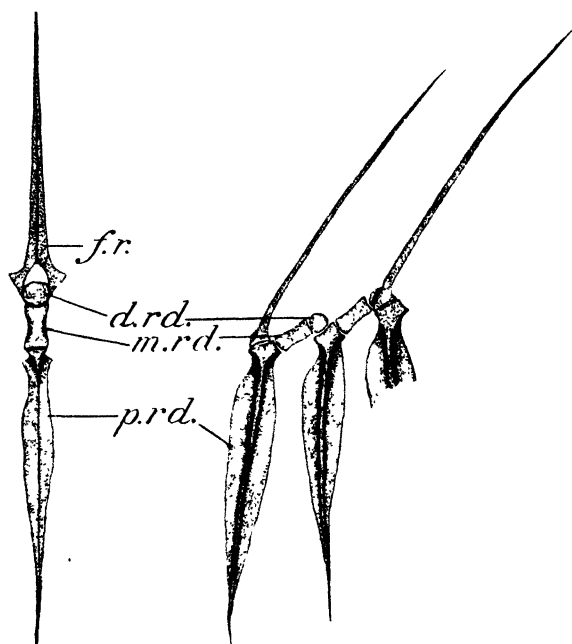


FIG. 23. Anterior and side views of radial and dermal ray of dorsal fin ( $\times 1\frac{2}{3}$ ).

*d.rd.*, distal piece of radial ; *f.r.*, fin-ray ; *m.rd.*, middle piece of radial ; *p.rd.*, proximal piece of radial.

<sup>1</sup> The Dermotrichia of fishes occur in four different kinds. They are : Ceratotrichia, Actinotrichia, Lepidotrichia and Camptotrichia.

The Ceratotrichia are slender, unjointed rods of homogeneous fibrous substances secreted by mesoblastic cells. They are found in Elasmobranchs, Holocephali and probably also in Acanthodi and Ithyotomi.

Actinotrichia are present at the edge of all the fins in the adult Teleostomes. They are unjointed, horny fibres and form the only dermotrichia in embryonic fins. They closely resemble the ceratotrichia of Elasmobranchs with which, it is possible, they are homologous. The actinotrichia develop in the mesoblastic cells below the epidermis. Only in the fatty or adipose fin of certain Teleostei (Salmonidae, Siluridae etc.) do the actinotrichia attain considerable size in the adult and form the sole organs of support.

Lepidotrichia are less numerous than the actinotrichia and are formed outside them in the more superficial mesoblastic layers. They are jointed

The radials always lie embedded within the musculature of the body and are formed in the median connective tissue septum. Those that support the dorsal and anal fins are quite similar and a description of the one holds good for the other also.

The Radial: Each radial is typically made up of three pieces. There is a large, linear or dagger-like, pointed part—the proximal piece of the radial. This is also called the Axonost or Inter-spinous bone, the latter name being given to it on account of its position between any two neural or hæmal spines. The second piece of the radial is a small cylindrical bone occurring horizontally in the median line between the distal ends of the axonost to which it belongs and the one succeeding it. This is called the Mesial piece of the radial: it is also known as the Baseost. The third or the last part of the radial is a very small cartilaginous piece occurring posterior to the mesial piece and lodged in a tiny depression on the anterior face of the distal end of the axonost succeeding the one to which it belongs. It also bears dorsally the fin ray of the next radial. Thus we find that the three parts of a radial are situated obliquely backwards from in front.

The Proximal piece of the radial (*p.rd.*) is an elongated dagger-shaped structure situated in the median septum. Its proximal end is thin, pointed and rod-like, and distally it flattens out into a broad structure with a bony head. Laterally, starting from the head and running to the proximal end is a lamina on each side of the piece serving for the attachment of the muscles controlling the movements of the fin-ray. Again, arising from the head end and directed posteriorly is a short thick cylindrical process which points slightly upwards and articulates with the proximal end of the mesial piece of the radial. On the head there is a small anterior depression to accommodate the distal piece of the preceding radial; there are also two lateral depressions, one on each side, for the reception of the two lepidotrichia constituting a fin-ray.

The whole proximal piece of the radial is flexible and transparent but the head is condensed and thick. The proximal end of the piece is connected by ligaments to the neural spines between which it occurs.

The Mesial Piece of the radial (*m.rd.*) is a cylindrical piece of bone attached proximally to the distal end of the dorsal process of the proximal piece and distally to the distal piece of the radial. It is short and directed backwards and upwards

and branched dermal fin-rays supporting the web of both the paired and median fins of all Teleostomi.

The Campyotrichia are characteristic of the Dipnoi. They are jointed and usually branched fin-rays formed of a bony substance. Each campyotrichium has an unjointed proximal piece embedded in the connective tissue and muscle and a distal jointed region always covered over externally by true scales (Goodrich, 29, pages 122, 273, 212 and 232).

and is also slightly depressed in its middle portion. The Distal Piece of the radial (*d.rd.*) is a minute rod-like cartilaginous piece lodged in a depression on the succeeding axonost. Anteriorly it is connected to the distal end of the mesial piece of its radial. It usually lies clasped between the proximal ends of the two lepidotrichia of the fin-ray belonging to the next radial.

The Fin-rays (*f.r.*) show the typical condition. Each is composed of two lepidotrichia united almost throughout their length and separate only at their bases, where they diverge from each other and clasp between them the distal piece of the previous radial and also the head of the radial to which they belong and which supports them. The fin-rays are all segmented and usually unbranched, the branching starting only from about the middle of the length of the ray. In *Otolithus* the fin-rays of the first dorsal fin are unbranched.

Each fin-ray possesses a pair of slender actinotrichia at its tip, between the lepidotrichia.

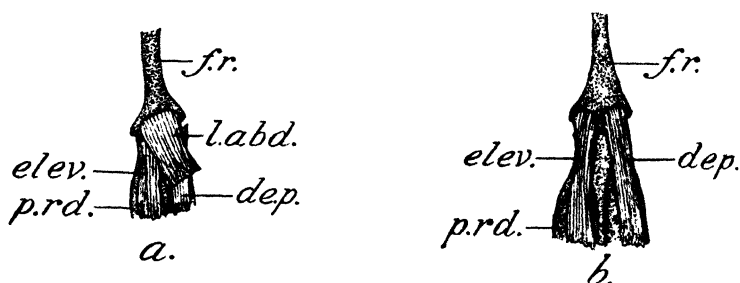


FIG. 24. Left side view of a radial and dermal ray of dorsal fin to show the muscles which work the ray ( $\times 2$ ).

*a*, Showing the abductor; *b*, Abductor removed to show the elevator and depressor.

*dep.*, depressor; *elev.*, elevator; *f.r.*, fin-ray; *l.abd.*, left abductor; *p.rd.* proximal piece of radial.

**The First Dorsal Fin:** The commencement of this fin is far forwards, almost on a line with the base of the pectoral fin. The fin is composed of ten rays, all of them jointed, sharp and spiny but unbranched, the first ray being short and thick. All the rays are connected together by a very thin and transparent piece of skin. These ten fin-rays are seated on nine radials the first of which bears the first two rays and the rest one each. Each radial is of the typical structure described already and is composed of the usual three pieces. The last of the nine radials, however, is represented only by the proximal and distal pieces.

The first radial is situated between the neural spines of vertebræ II and III, and the last radial between those of vertebræ

VIII and IX. The first radial is large and exhibits at its dorsal anterior part, a cleft. It bears the first ray which is small and spiny, and the second which forms the largest of the ten rays. They gradually decrease in length from the second, the last being the smallest.

**The Second Dorsal Fin :** This fin arises close behind the first, almost continuous with it, and ends only at the base of the caudal fin. It is made up of one strong spine and thirty branched fin-rays, all of them of nearly equal length. There are thirty radials each of the same structure as those of the first dorsal. Each bears one ray, except the first which bears in addition, the spine. The proximal piece of the first radial is situated between the neural spines of vertebræ VIII and IX, and that of the last between the neural spines of vertebræ XX and XXI. Thus it is evident that more than one proximal piece may occur between the neural spines. The last radial is devoid of the distal piece. All the axonosts bear the lateral laminae.

The axonosts decrease in length as we proceed backwards and at the distal end of each, on either side of the lateral lamina, plenty of fat has been found to be stored and this gives a bright yellow colour to that part of the axonost and makes it stand out clearly against the white flesh.

The first spine is short and pointed, and the next fin-ray is single and unbranched, the remaining twenty-nine being clearly branched. The piece of skin connecting the fin-rays, unlike that of the first dorsal is very thick and fleshy.

## 2. *The Anal Fin.*

The Anal fin occurs immediately behind the anus. It is very short, but its fin-rays are large in size with numerous branches. It is made up of a large strong spine and eight fin-rays mounted on seven radials altogether. Occasionally an additional short spine is found in front of the first long one. In structure, the radials and fin-rays are quite similar to those of the dorsal fins. The proximal part of the first radial is unusually long; in fact, it is the longest axonost of any of the median fins. Its proximal end is directed upwards and forwards and at its anterior extremity it curves up and lies in close apposition with the anterior face of the hæmal spine of the thirteenth vertebra (the second caudal). The head of this axonost is thick and bears the spine, and between it and the next fin-ray is interposed a small piece of bone, very probably a basal. Further, the first axonost shows an anterior demarcation at its distal end suggesting a division of the axonost into two. The presence of the basal-like bone and the imperfect division on the first axonost suggest that it might have resulted by the fusion of two axonosts. This seems quite probable because, while in all other median fins

the number of axonosts is just one less than the number of fin-rays, in the case of the anal fin it is two less. Very likely the extra axonost which is missing has fused with the next one to form a single axonost. This suggestion is also supported by the presence of the basal piece between the spine and the fin-ray borne by the first axonost, as otherwise the presence of such a basal cannot be accounted for.

The second axonost of the anal fin is only about half the first in length. The others decrease in length from in front backwards. The last or the seventh is the smallest and is situated between the hæmal spine of vertebrae 16 and 17. As in the dorsal fins, the last radial is represented only by the proximal and middle pieces and in this case it carries the last two fin-rays.

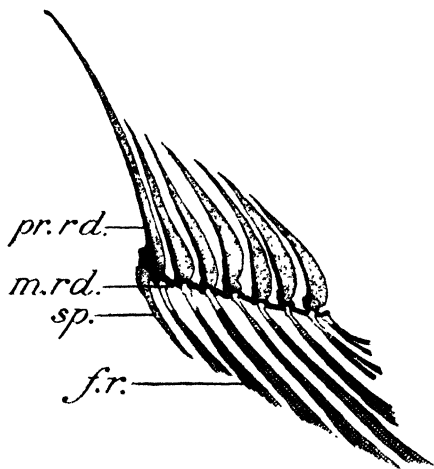


FIG. 25. The Anal fin ( $\times 2$ ).

*f.r.*, fin-ray; *m.rd.*, middle piece of radial; *pr.rd.*, proximal piece of radial; *sp.*, spine of anal fin.

The piece of skin connecting the fin-rays is thick as in the second dorsal fin.

**The Mechanism of the Fin-rays of the Median Fins:** Each fin-ray is made up of two lepidotrichia closely united to each other except at the base where they diverge and clasp the axonost which bears them. Six muscles (in three pairs) connect the fin-ray to its axonost and these are responsible for the movements of the ray in any direction.

The first pair of muscles is very broad and short, occurring one on each side of the median line. Proximally they are connected to the skin and distally they are attached to the broad bases of the lepidotrichia of the fin-ray. These muscles are not in any way connected with the radials. Their contrac-

tion inclines the fin-ray sideways. A similar set of muscles with quite a similar action found in the Sole has been termed by Cunningham,<sup>1</sup> the right and left Abductors (*labd.*).

The other two pairs of muscles connect the fin-ray to the axonost. They are called the 'Elevators' (*elev.*) and the 'Depressors' (*dep.*) according as they elevate or depress the fin-ray in the median plane. In *Otolithus* the anterior pair forms the elevators and the posterior the depressors. There is a right elevator and a left elevator constituting the anterior pair; similarly a right and left depressor constitute the posterior pair. The elevators are attached to the axonost proximally and are inserted on the body of the axonost in front of the lateral lamina. The depressors are inserted posterior to the lamina. In other words, the elevator and depressor of one side are separated by the lateral lamina. The elevators are broader than the depressors and distally they are attached to the anterior part of the bases of the lepidotrichia, and the depressors have their attachment at the posterior part. Both the elevator and the depressor muscles of one side lie beneath and are covered by the abductor of the same side.

The axonosts are connected together by a longitudinal ligament which prevents them from hanging loose. There is also a transverse ligament which prevents a side-to-side movement of the axonost. The backwardly directed distal process of the axonost which goes to meet the mesial piece has a small cartilaginous cap, and a similar cap is provided for both the ends of the mesial piece. The internal sides of the bases of the lepidotrichia also possess a thin cartilaginous lining.

### 3. The Caudal Fin.

The Caudal Fin of *Otolithus ruber* is large and typically Homocercal.<sup>2</sup> The last vertebra, as already stated, is modified

<sup>1</sup> Cunningham. *The Common Sole*. 1890.

<sup>2</sup> There are three types of caudal fin in fishes.

The most primitive type is the Protocercal (Diphycercal) where the vertebral column is continued straight into the caudal fin, the two lobes (epichordal and hypochordal) of which are thus symmetrical both externally and internally. This occurs in the Holocephali, *Polypterus* and Dipnoi and a few Selachii and Teleostei.

The next advanced type is the Heterocercal. Here the posterior end of both the notochord and the vertebral column is bent dorsalwards and the fin-rays show an asymmetrical distribution; the hypochordal lobe of the fin will be larger than the epichordal. This type shows asymmetry both externally and internally and is found in all the Elasmobranchii, Chondrostei, *Amia* and *Lepidosteus*.

A further specialised type is the Homocercal fin. This is found in the majority of the Teleostei. In this case a shortening of the vertebral axis takes place, the dorsal lobe of the fin is more suppressed and the ventral lobe better developed. The fin is symmetrical externally and asymmetrical internally.



and takes a great part in the support of the caudal fin. It is imperfectly developed and possesses only half a centrum. From the posterior end of this arise in a radiating manner two structures, flattened sideways. These are the two compound Hypural bones of the caudal fin. Each of these can be divided into three parts. The Urostyle is so constricted as not to be visible. There are two very well-developed lateral hypural spines, one on each side. Dorsal to the hypurals we get two rod-shaped bones which do not quite reach up to the vertebral column, but are connected to it by ligaments. These are the two dorsal caudal radials; the anterior of these is the longer of the two.

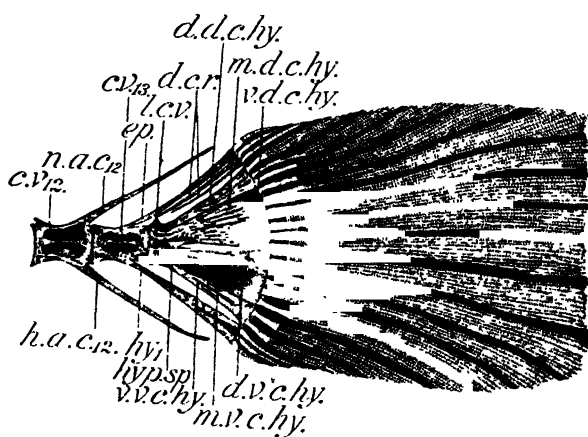


FIG. 26. Skeleton of caudal fin (Nat. Size.)

*c.v.12.*, twelfth caudal vertebra; *c.v.13.*, thirteenth caudal vertebra; *d.c.r.*, dorsal caudal radials; *d.d.c.hy.*, dorsal part of the dorsal compound hypural; *d.v.c.hy.*, dorsal part of the ventral compound hypural; *ep.*, epural; *h.a.c.12.*, haemal arch of twelfth caudal vertebra; *hy1.*, first hypural; *hyp.sp.*, hypural spine; *l.c.v.*, last caudal vertebra; *m.d.c.hy.*, middle part of the dorsal compound hypural; *m.v.c.hy.*, middle part of the ventral compound hypural; *n.a.c.12.*, neural arch of the twelfth caudal vertebra; *v.d.c.hy.*, ventral part of the dorsal compound hypural; *v.v.c.hy.*, ventral part of the ventral compound hypural.

The neural arch of the penultimate caudal vertebra is long and flattened and reaches up to the base of the caudal

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Lastly, in some Teleostean groups (*Fierasfer*, *Callionymus*) the caudal fin tapers to a symmetrical end and looks like a diphyccercal fin. This occurs as the result of the reduction of the tip of the heterocercal or homocercal fin in the later developing stages. Such a false or secondary diphyccercal fin is called Gephyrocercal. (Goodrich—29, pp. 101, 104 and 355).

fin-rays. Thus it forms the single Epural bone (*ep.*) of the caudal fin. The hæmal arch of the same vertebra is also flattened and forms the first hypural of the caudal fin.

On the whole, therefore, we have in the caudal fin the following elements: a single epural, two dorsal caudal radials, three hypural bones (two of them being of a compound nature and capable of division into three each), two hypural spines and a very much reduced, if not insignificant, urostyle.

The epichordal lobe of the fin proper is much reduced and is made up of only three fin-rays (very rarely four or even five), all of them unbranched and borne one each by the epural and the two dorsal caudal radials. The hypochordal lobe of the fin forms the largest part of the caudal fin and consists of nineteen fin-rays. These are borne by the hypurals, and the three rays borne by the first hypural are also unbranched.

The last Caudal Vertebra is inseparably united to the caudal fin and contributes much to its formation. It is a structure which has all the features of a reduced centrum and is united to the penultimate caudal vertebra. A distinct neural arch is absent but there is a slight dorsal eminence on the centrum. Through this runs a tiny canal which seems to be a continuation of the neural canal of the preceding vertebra. In all likelihood the eminence is a vestige of the neural arch of the last vertebra. The dorsal tip of the eminence is just touched by the proximal end of the anterior dorsal caudal radial. No indication of a hæmal arch is present.

The posterior end of the last vertebra is slightly directed upwards and imperceptibly passes on into the compound hypural bones.

The Urostyle is not clear in the caudal fin.

In the caudal fin of *Otolithus* there is only one epural present. It is the modified neural arch of the penultimate caudal vertebra. According to Goodrich (35) it is formed by the union of a true radial with the neural spine. It is thin and rod-like, long and transparent, springing dorsally from very near the posterior end of the centrum of the penultimate vertebra and bearing at its free end a single unjointed and unbranched fin-ray, the first fin-ray of the epichordal lobe. At the base of the epural there is a tiny neural canal.

The Dorsal Caudal Radials (*d.c.r.*) are two in number, rod-shaped and occurring posterior to the epural, and connected to the vertebral column only by ligaments. The anterior one is longer and proximally it almost touches the short ill-formed neural arch of the last vertebra. At its distal end it bears only one fin-ray—the second fin-ray of the epichordal lobe. The posterior dorsal caudal radial is shorter but more flattened laterally. Distally it bears the last fin-ray of the epichordal lobe of the fin. The dorsal caudal radials are also considered as epurals by some authors.

The Hypurals are three in number the first being single and the others compound. Each compound hypural is flattened sideways with its posterior edge typically convex. Between the two compound hypurals there is a small space filled in the fresh condition with muscles.

The First Hypural (*hy*<sub>1</sub>) is a single, flattened, long bone derived according to Goodrich (35) by the fusion of the hæmal spine of the penultimate caudal vertebra with the corresponding radial of the caudal fin. It gradually broadens out towards its distal end where it bears three jointed but unbranched fin-rays of the hypochordal lobe. The first hypural is separated from the second which lies dorsal to it, except at the distal end where it touches the latter.

The Second Hypural is a large, fan-shaped, compound bone forming the ventral of the two compound hypurals in which the vertebral column terminates. Proximally it is connected to the posterior end of the last vertebra and distally it has a convex edge which bears the fin-rays.

At the base of the second hypural is situated the hypural spine (*hyp.sp.*) one on each side. Immediately posterior to it, on each side, is an opening through which the caudal artery passes. The openings are confluent anteriorly with the hæmal canal of the last vertebra.

The second hypural is divisible into three parts. Lines separating these three portions are clearly visible but at the proximal end they unite with the lower half of the last vertebra. For the sake of description the three parts may be termed, according to their position, dorsal, middle and ventral (*d.v.c.hy.*, *m.v.c.hy.*, and *v.v.c.hy.* respectively). The dorsal and ventral are narrow and of the same length while the middle one is nearly four times as broad as the dorsal or ventral.

The whole second hypural bears at its distal end seven of the fin-rays of the hypochordal lobe. The distribution of these seven fin-rays among the three parts of the hypural is as follows: the dorsal part carries one ray, the middle part four and the ventral part two rays.

The Third Hypural is the dorsal compound hypural. This is also large and laterally compressed and resembles a sector of a circle in shape. This also, like the second hypural, can be divided into three parts, a dorsal, a middle and a ventral (*d.d.c.hy.*, *m.d.c.hy.*, and *v.d.c.hy.* respectively). In this case the dorsal part is the narrower and the middle and ventral parts broader. Proximally the three converge and indistinguishably pass into the dorsal half of the last centrum.

The distal end of the bone is convex and bears nine fin-rays, each of the three parts carrying three rays. The dorsal part bears the first three rays of the hypochordal lobe of the caudal fin.

The Caudal Fin-rays and their Structure: As already

stated, the fin-rays are twenty-two in number. Of these, three go to form the epichordal lobe which fails to reach the extremity of the caudal fin, and the remaining nineteen form the hypochordal lobe which represents the main part of the fin. The last three fin-rays of the hypochordal lobe (borne by the ventralmost hypural) are single and unbranched and the last two alone do not reach the extremity of the fin.

Each fin-ray, like that of the dorsal or the anal fin, is paired in structure. It consists of two lepidotrichia each separable from the other longitudinally. Proximally the two lepidotrichia diverge slightly and clasp between them the cartilage-capped distal end of the epural or hypural that bears them. Distally the two lepidotrichia lie in close apposition. They are thick and round proximally and flattened out distally. In the proximal half of each ray, in the space between the two diverging lepidotrichia has been noticed a large quantity of fatty substance which gives, in the fresh condition, a yellow colour to the base of the caudal fin.

The fin-rays do not have proximal articular processes as in those of the paired fins, connecting each with its neighbour. The space between any two rays is filled up with muscles and fatty substance.

A pair of actinotrichia is present at the distal end of the fin-ray, between the two lepidotrichia.

## II. Appendicular Skeleton.

The Appendicular Skeleton comprises the Pectoral girdle, the Pelvic girdle, and the Pectoral and Pelvic fins. The pectoral girdle and fins are situated far forwards immediately behind the posterior end of the operculum. The pelvic girdle and fins are situated more ventrally, in fact, on the mid-ventral line, on a level with the pectoral fins and may therefore be said to be thoracic in position.

### *Pectoral Girdle.*

The pectoral girdle lies behind the posterior angle of the operculum. It is made up of two symmetrical halves, each being independent of the other except for the union of the tips of the two cleithra at the anterior end under the throat. The tips of the cleithra converge towards the median line and meet at the anterior end and thus abut into the angle formed by the two halves of the hyoid cornu. A ligamentous connection exists between these tips and the posterior end of the median urohyal bone.

The Pectoral girdle may be divided into 1. The Primary Girdle and 2. The Secondary Girdle. The former is endoskeletal in origin and much reduced but the latter is dermal and more prominent.

The primary girdle is made up of the Coraco-scapular elements, the Coracoid and Scapula, both of them paired, one member of each pair going to form one half of the girdle. The two halves of the primary girdle are distinct and do not meet in the middle line. The Meso-coracoidal element is absent in the pectoral girdle of *Otolithus*.

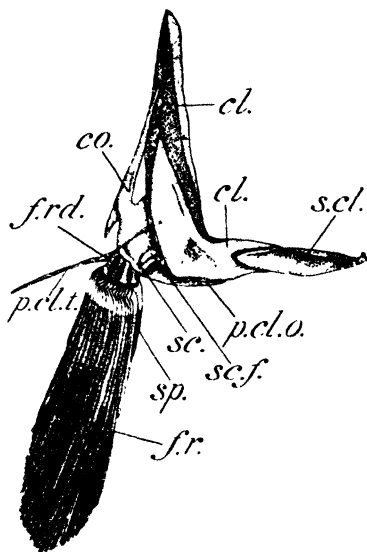


FIG. 27. External view of the left half of pectoral girdle and fin ( $\times 1\frac{1}{4}$ ).

*cl.*, cleithrum; *co.*, coracoid; *f.r.*, fin-ray; *f.rd.*, fin-radial; *p.cl.t.*, linear part of post-cleithrum; *p.cl.o.*, oval part of post-cleithrum; *sc.*, scapula; *sc.f.*, scapular foramen; *s.cl.*, supra-cleithrum; *sp.*, spine of pectoral fin.

The secondary girdle is similarly made up of two identical halves which, however, meet in the middle line, *viz.*, the union of the two cleithral tips anteriorly. Each half of the girdle consists of the Cleithrum, a large L-shaped bone (the largest bone in the whole girdle), the Supra-cleithrum which is united to the cleithrum dorsally, the Post-temporal which connects its half of the girdle to its side of the skull, and the Post-cleithrum attached ventral to the cleithrum and possessing a cartilaginous spine-like piece directed towards the mid-ventral line.

The Primary Girdle is relatively unimportant compared to the secondary girdle. The coraco-scapular elements which comprise it are attached to the inner side of the cleithra, (the clavicles).

The Scapula (*sc.*) is a roughly oval bone with a large foramen, the scapular foramen, in its middle so that it has the shape of a ring. It is found on the inner face of the angle of the L-shaped cleithrum. Dorsally and anteriorly it secure

attachment to the cleithrum, ventrally to the coracoid, and its posterior edge bears the radials of the pectoral fin. Anteriorly a part of the scapula is overlapped by the outer lamina of the cleithrum. The posterior edge of the bone is straight and bears almost all the radials except the first which is attached to the coracoid. Along the sides of the scapula except the posterior, is a thin cartilaginous line separating the bone from the adjoining edges of the surrounding bones.

The Coracoid (*co.*) is a roughly L-shaped bone, the bend of the L being a bit rounded off. The long arm of the L is connected anteriorly to the inner lamina of the cleithrum while the short one is connected dorsally with the cleithrum and posteriorly with the scapula. The long arm is also produced beyond the angle of the L into a posteriorly directed short spiniform process. The ventral edge of the short arm bears the first radial (brachial ossicle). There is a triangular foramen in the inner lamina of the cleithrum owing to the L-shape of the coracoid. The dorsal edge of this foramen is formed of the cleithrum, the posterior by the shorter arm of the coracoid and the ventral by the long arm of the coracoid. Between the coracoid and the scapula there persists a small strip of cartilage.

The Secondary Girdle is better developed than the primary and assumes greater importance. It is made up of four bones.

The Cleithrum-(clavicle)-(cl.) is a large L-shaped bone. The short arm of the L is single but the long arm is folded on itself so that there is an outer lamina and an inner lamina. There is a deep groove situated in the angle formed by these two laminae. The inner lamina has on its inner side, at the anterior end, a deep canal, the muscle canal. Dorsally also at the anterior end of the long arm, on the outer lamina, is another muscle canal. The long arm lies horizontally with its tip directed anteriorly where it unites with the tip of the cleithrum of the opposite side. The short arm lies vertically, with its tip pointing dorsally. Near its dorsal end is an external semi-oval depression which lodges the lower half of the oval supra-cleithrum. On the inner lamina of the cleithrum, immediately in front of the anterior edge of the scapula, is another well-developed muscle canal.

The Supra-cleithrum (*s.cl.*) is an oval bone with a well-developed flattened knob at the end connected with the supra-temporal. Its lower half overlaps the tip of the shorter arm of the cleithrum and its distal knobbed end is overlapped by the supra-temporal. It has a prominent strong ridge on its anterior margin.

The Post-cleithrum (*p.cl.*) is made up of two pieces, an upper oval piece and a lower linear piece which is slightly broad at its base and pointed distally. The post-cleithrum is attached to the inner side of the angle of the cleithrum by the oval part

which passes internal to the radials, while the linear piece is free and lies in the musculature directed towards the mid-ventral line.

The Post-temporal (*p.temp.*) consists of a thin, oval, expanded fan-like, posterior piece with rays, and anteriorly, two limbs, one long and pointed and the other short with a clubbed end. In fact, the fan-like piece may be said to be forked anteriorly. The long pointed limb is flat and connected by fibrous tissue to the dorsal surface of the epiotic bone at the place where the two epiotic processes start. The shorter limb is attached to the opisthotic bone, its distal tip being lodged in a small depression on the dorsal surface of that bone.

The broad leaf-like portion of the post-temporal is oval in shape and the rays which proceed from its base (wherefrom the forking begins) to the periphery. On the outer surface of the fan-like piece there are two small tunnels, obviously of the lateral line canal. On the inner surface there is a depression into which the knobby head of the supra-cleithrum fits. Very near the depression is a minute foramen. The supra-temporal overlaps the upper half of the supra-cleithrum.

### *Pectoral Fin.*

The skeleton of the fin consists of The Radials and the Fin-Rays.

The Radials are four in number varying in size. The last ventral radial is the largest and the other three are situated dorsal to it, each smaller than the one below, so that the first of the dorsal is the smallest. Dorsal to these four is seen a small knob-like projection from the scapula. This projection bears a single fin-ray, the first one dorsally. The last or the ventral-most radial is borne at the joint between the scapula and the coracoid and the rest of the radials are borne by the posterior edge of the scapula. The coracoid thus contributes very little to the glenoid formation. The distal free ends of the radials are broad and flattened. Connecting the distal ends of all the radials is a thin cartilaginous strip to which are attached the fin-rays.

The Fin-Rays are seventeen in number. This number was found constant in half a dozen specimens that were examined. Each ray consists of two pieces—lepidotrichia—enclosing (not completely enclosing, however) a central core of soft tissue. The ray is segmented for the greater part of its length, only a small portion of the proximal end being unsegmented. The proximal ends of the two lepidotrichia diverge and clasp the cartilaginous strip already described. Each piece of the ray gives off, near the articulation to the cartilaginous piece, a downwardly directed articular process, and the two processes of each fin-ray clasp the head of the ray immediately

below it. This mechanism of one ray holding tightly the ray next below it gives the whole fin some rigidity which it would lack were the fin-rays independent of one another.

The first or the pre-axial fin-ray is unsegmented, short and spine-like with a swollen protruding head which articulates directly with the small knob of the scapula. All the other rays are long, segmented and branched and the branches may vary from two to four in number. The rays slightly decrease in length from the pre-axial to the post-axial margin of the fin.

### *Pelvic Girdle.*

The Pelvic girdle, like the Pectoral, is made up of two similar halves. Each half of the girdle consists of a single

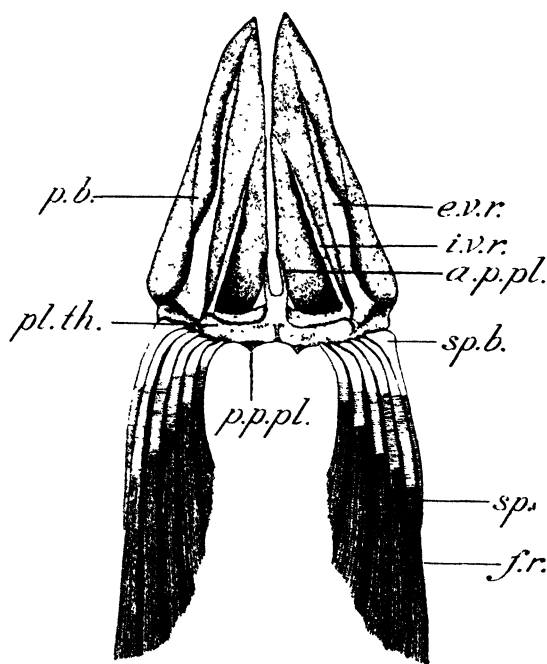


FIG. 28. Ventral view of pelvic girdle and fin (Nat. Size).

*a.p.pl.*, anterior process of pelvic girdle; *e.v.r.*, external ventral ridge; *f.r.*, fin-ray; *i.v.r.*, internal ventral ridge; *p.b.*, pelvic bone; *pl.th.*, posterior thickening of pelvic bone; *p.p.pl.*, posterior process of pelvic girdle; *sp.*, spine of pelvic fin; *sp.b.*, enlarged base of spine.

bone, the Pelvic bone (*p.b.*), which is triangular in shape, the apex being anterior. The base of the triangle is rather short, while the other two sides are nearly twice as long as the base and meet far anteriorly at the apex. The inner margin of the



bone is at right angles to the base, and the two inner margins of the two halves of the girdle lie close together in the mid-ventral line. The base, namely, the posterior margin, is very much thickened in the form of a stout rod (*pl.th.*). There is fusion between the two thickened bases of the two halves. It is to this thickened base that the pelvic fin-rays are attached. Ventrally, on each pelvic bone there are two large wall-like ridges which meet at the outer angle at the base of the bone, and serve for the attachment of muscles. Ventrally, from the posterior thickened part, on either side of the mid-ventral line is a small bony process directed backwards. There is a similar thin process directed forwards. The dorsal surface of the pelvic bone is quite simple except for a deep groove situated close to the outer edge, for the lodgement of muscles.

The Pelvic girdle as a whole is lodged in the angle formed by the two cleithra of the pectoral girdle and its tip is attached by ligaments to the united tips of the cleithra.

### *Pelvic Fin.*

Radials for the support of the pelvic fins are absent in the pelvic girdle of *Otolithus*. The posterior thickened ossification on the pelvic bone serves for the attachment of the fin-rays. There are six fin-rays on the whole, constituting the pelvic fin. The first or the outermost one is very long and spine-like. The other five are segmented and branched profusely. The proximal end of each fin-ray is bifid as in the case of the pectoral fin i.e., there are two lepidotrichia going to form a fin-ray, but distally the lepidotrichia are almost inseparably united together. The lepidotrichia of a fin-ray give off proximally two inwardly directed articular processes which clasp tightly between them the base of the fin-ray immediately inner to them. This condition is similar to what obtains in the pectoral fin, giving rigidity to the fin as a whole. Distally, each ray is branched, the branches being more than twenty in some cases. The rays decrease in length as we proceed inwards.

A pair of actinotrichia occurs on each fin-ray as in those of the pectoral fin.

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**Some of the Common Flowering Plants of the Hyderabad State, their distribution and economic importance.**

*Monocotyledons—Part I.*

By M. SAYEED-UD-DIN.

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INTRODUCTION.

Since the publication of my paper<sup>1</sup> on some of the common Dicotyledonous Flowering Plants, I have been engaged in a systematic study of the Monocotyledonous material in the collections of the Botany Department of the Osmania University. The present paper is a record of some of the Monocotyledonous plants found either wild or under cultivation in the Hyderabad Dominions. Here again, as in the last paper, I have mainly confined myself to the city environs, and Mulug—a *talukha* of the Warangal District of Hyderabad, and a Government Forest Reserve.

The arrangement of the families is in accordance with the classification adopted by Engler and Prantl in 'Der Natürlichen Pflanzenfamilien' and revised by Engler in 'Syllabus der Pflanzenfamilien'. Notwithstanding the defects of this system from the phylogenetic point of view, especially in the case of Monocotyledons, I have followed it only for the sake of a little convenience which I feel in the comparatively narrower limits, of some of the families in this system, viz. Scitamineæ of Bentham and Hooker's Classification is split up into four distinct families by Engler, i.e., Musacæ, Zingiberacæ, Cannacæ, and Marantacæ. Altogether 111 species belonging to 23 families of Monocotyledons are recorded, out of which 30 are believed to have a medicinal value and which are remarked as medicinal

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<sup>1</sup> *JASB, Sc.*, Vol. I, 1935, p. 9.

or officinal at the end of their description. The literature cited at the end of the paper may be referred to for the medicinal properties of the plants mentioned as medicinal in this list. I have recorded a number of vernacular names of the plants, but they are not sufficient by themselves for identifying any plant. They may be advantageously used as mere clues for the determination of the species, but in every case the results must be confirmed by an examination of the plants.

#### ACKNOWLEDGMENTS.

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#### SYSTEMATIC ACCOUNT.

##### I. TYPHACEÆ.

##### 1. *Typha elephantina* Roxb., *F.B.I.*, VI, p. 489.

Syn.:—*Typha angustifolia* Linn.

*Vern. Name*: *Tunga* (Hind.).

*Habitat*: Extremely common throughout the Dominions in canals and riversides, etc.

*Uses*: The culms are formed into hoods by the *Coonbis* (agricultural class of villagers), to protect themselves from rain. *Tunga* is a favourite food of elephants. Medicinal.

##### II. PANDANACEÆ.

##### 2. *Pandanus odoratissimus* Linn., *F.B.I.*, VI, p. 485.

(The Screw Pine.)

*Vern. Names*: *Keura* (Hind.); *Mogilli* (Tel.).

*Habitat*: Found throughout the Dominions near water-courses. Also planted in gardens.

*Uses*: The fragrant flowers are sold in the bazaars. They are worn in the hair by women; and are used in temples. The leaves yield an excellent fibre. Medicinal.

### III. POTAMOGETONACEÆ.

3. **Potamogeton indicus** Roxb., *F.B.I.*, VI, p. 565.

*Habitat* : Abundant in pools, tanks, and water-courses.

### IV. APONOGETONACEÆ.

4. **Aponogeton monostachyon** Linn., *F.B.I.*, VI, p. 564.

*Habitat* : In tanks and pools.

### V. ALISMACEÆ. (ALISMATACEÆ.)

5. **Sagittaria sagittifolia** Linn., *F.B.I.*, VI, p. 561.

*Habitat* : Pretty common in water-holes in many parts.

*Uses* : The leaves are eaten as greens.

### VI. HYDROCHARITACEÆ.

6. **Ottelia alismoides** Pers., *C.F.B.P.*, V, II, Pt. IV, p. 671.

*Habitat* : Very common in ponds and lakes, at least on the Telangana side.

7. **Hydrilla verticillata** Presl., *C.F.B.P.*, V, II, Pt. IV, p. 668.

*Habitat* : Commonly found in ponds and tanks.

8. **Elodea canadensis** Michx., Mayuranathan, p. 279.

*Habitat* : Very common in ponds and lakes. It is a native of Canada and the United States, but it is naturalized in many parts of India.

9. **Vallisneria spiralis** Linn., *C.F.B.P.*, V, II, Pt. IV, p. 669.

*Habitat* : Found in ponds, also grown in cisterns in gardens.

### VII. GRAMINEÆ.

10. **Pennisetum typhoideum** Rich., *F.B.I.*, VII, p. 82.  
(The ' Bajra ' Millet.)

*Vern. Name* : *Bajra* (Hind.).

*Habitat* : Largely cultivated all over.

*Uses* : The grains which are much inferior to *Jawar* (*Andropogon sorghum*) are used as food by the poor classes.

11. **Panicum miliaceum** Linn., *F.B.I.*, VII, p. 45.

*Vern. Name* : *Worgloo* (Tel.).

*Habitat* : Cultivated.

12. **Panicum italicum** Roxb., *F.I.*, I, p. 302.

*Vern. Name* : *Rallah*.

*Habitat* : Cultivated towards Aurangabad side, also in the Warangal District.

*Uses* : The grains are a good food of pet birds.

13. **Paspalum scorbiculatum** Linn., *F.B.I.*, VII, p. 10.

*Habitat* : As far as I know it is not wild, but is cultivated.

14. **Saccharum officinarum** Linn., *F.B.I.*, VII, p. 118.

*Vern. Names* : *Nai-shakar*, *gunna* (Hind.).

*Habitat* : Not wild ; is now being extensively cultivated in the Nizamabad District with the abundant supply of water from the 'Nizam Sagar'.

*Uses* : Its use as the chief source of our manufactured sugar is too well known. Medicinal.

15. **Saccharum cylindricum** Lamk., Duthie—*The Fodder Grasses of North India*, p. 23.

*Syn.* :—*Imperata arundinacea* Cyrill.

*Vern. Name* : *Ban*, for cord only (Hind. local).

*Habitat* : Very common.

*Uses* : The dried culms make a strong cord known as 'ban' with which the village cots are corded.

16. **Ischæmum pilosum** Hack., *F.B.I.*, VII, p. 130.

*Vern. Name* : *Kunda* (Mar.).

*Habitat* : A common grass of the Marhatwari side. A great pest to the cultivators.

17. **Andropogon contortus** Linn., *F.B.I.*, VII, p. 199.

*Vern. Names* : *Suriali*, *Survale-ki-ghas* (Hind.) ; *yedi* (Mar.)

*Habitat* : A very common grass in all places.

*Uses* : When green, this grass makes a good fodder for cattle.

18. **Andropogon squarrosus** Linn., *F.B.I.*, VII, p. 186.

*Vern. Name* : *Khas* (Hind.).

*Habitat* : Not very common.

*Uses* : The roots either alone or mixed with *Rowsa* grass are made into 'chicks' and hung in front of doors in summer. When moistened they emit a pleasant fragrant odour. A perfume is also extracted from the roots. Medicinal.

19. **Andropogon irasacusa** or **schoenanthus** Linn., *F.B.I.*, VII, p. 204. (The *Rusa* oil grass.)

*Vern. Names* : *Rausa*, *Rowsa* (Hind.).

*Habitat* : Common everywhere in open fields.

*Uses* : A fragrant oil is distilled from it. This grass is used with the *Khas* grass for *chicks*. Cattle fed on it are said to yield good milk. The oil is believed to have a medicinal value.

20. **Andropogon sorghum** Brot., *F.B.I.*, VII, p. 183.  
(The 'Juar' Millet.).

*Vern. Names* : *Jawar*, *Jowar*, *Jowari* (Hind.) ; *Jonna* (Tel.).

*Habitat* : Both the yellow and white varieties are extensively cultivated all over.

*Uses* : The grains form the staple food of the poor classes. The stalks with leaves known as 'Karbi' are the chief fodder for cattle.

21. **Coix lachryma** Linn., *F.B.I.*, VII, p. 100.  
(Job's tears.)

*Habitat* : Common in rice fields and marshy places. Plants were collected from a rice field in 'Mulug'.

*Uses* : The white glazy nuts are used as beads by some of the wandering tribes like the 'Lambadas' and the 'Banjaras' who also use them for working in embroidery on their clothes. Medicinal.

22. **Anthistiria ciliata** Linn., *F.B.I.*, VII, p. 213.

*Vern. Name* : *Chuneria* (Hind.).

*Habitat* : A common grass in pastures and forests.

*Uses* : Good for cattle grazing.



23. **Aristida setacea** Retz., *F.B.I.*, VII, p. 225.  
(Broom grass.)

*Vern. Names* : *Jadoo-ka ghas* (Hind.) ; *Sepru-gaddi* (Tel.).

*Habitat* : A common grass, growing on dry open ground and on hill-sides.

*Uses* : Dry culms are tied up in bundles, and are used as brooms.

24. **Aristida redacta** Stapf., *F.B.I.*, VII, p. 227.

*Habitat* : A troublesome grass which is very common on dry soil and hill-slopes.

25. **Cynodon dactylon** Pers., *F.B.I.*, VII, p. 288.

*Vern. Names* : *Duba*, *Kali ghas*, *hariali* (Hind.) ; *Haryali* (Tel.) ; *Durva*, *Haryeli* (Mar.) ; *Arugam-pilla*, *Hariali* (Tam.).

*Uses* : Good for cattle grazing. It is much used for laying out lawns, etc. Medicinal.

26. **Eleusine coracana** Gaertn., *F.B.I.*, VII, p. 294.  
(Ragi Millet.)

*Vern. Names* : *Muttengapilloo* (Tel.), *Makra* (Hind.).

*Habitat* : A cultivated grass.

*Uses* : An article of diet for the poor classes.

27. **Eleusine aegyptiaca** Desf., *F.B.I.*, VII, p. 295.

*Habitat* : Also cultivated.

28. **Oryza sativa** Linn., *F.B.I.*, VII, p. 92.  
(The Rice plant.)

*Vern. Names* : *Dhan* (applied to the grains with the husk on), *Chaval* (Hind.).

*Habitat* : Wild in many parts of India. Partridge mentions that it is wild in Hyderabad also, but I have not seen it. Cultivated extensively towards Telangana side.

*Uses* : Rice is a staple food of all classes. Several savoury and sweet preparations are made of it. Light preparations as diets for invalids are made out of rice. Boiled rice, when hot has been used for making poultice as substitute for linseed or flour. Medicinal.

29. **Bambusa arundinacea** Willd., *F.B.I.*, VII, p. 395.  
(The Spiny Bamboo.)

*Vern. Names* : *Bans* (Hind.); *Bongu*, *Yedru* (Tel.); *Mandgai* (Mar.).

*Habitat* : This is the principal species in the Warangal forests, as well as in the north of Godavari, and in Amrabad.

*Uses* : Used in mat-making, baskets, scaffolding, etc.

30. **Dendrocalamus strictus** Nees., *F.B.I.*, VII, p. 404.  
*Syn.* :—*Bambusa stricta* Roxb. (Male Bamboo.)

*Vern. Names* : *Bans* (Hind.); *Kanka*, *Yedru* (Tel.).

*Habitat* : Common both on the Marhatwari and on the Telangana side.

*Uses* : The bamboos are strong and elastic ; they are used for building purposes, baskets, and mat-making, and in the manufacture of cane furniture, etc.

31. **Zea mays** Linn., *F.B.I.*, VII, p. 102. (Maize.)

*Vern. Names* : *Makka*, *Makai*, *Makai-ka-bhutta* (for fruit), (Hind.).

*Habitat* : Cultivated all over.

*Uses* : The roasted fruit is nourishing and tasty. Maize meal is a valuable diet for invalids and children. Medicinal.

32. **Triticum vulgare** or **sativus** Vill., *F.B.I.*, VII, p. 367.

*Vern. Name* : *Gehoon* (Hind.).

*Habitat* : Cultivated more towards the Marhatwari side than towards the Telangana.

*Uses* : Too well-known as an article of food, etc. to be detailed here.

## VIII. CYPERACEÆ.

33. **Cyperus rotundus** Linn., *F.B.I.*, VI, p. 614.

*Vern. Name* : *Naga-mutha* (Tel.).

*Habitat* : Extremely common with *Hariali* (*Cynodon dactylon*) to the extent of being a pest which is most difficult to eradicate.

*Uses* : The tubers are a favourite food of pigs and are supposed to be very fattening. An oil is extracted from the tubers, being used for anointing the hair.

34. *Cyperus scariosus* Br. Prodr., p. 216, *F.B.I.*, VI, p. 612.

*Habitat* : Common throughout.

35. *Scirpus articulatus* Linn., *F.B.I.*, VI, p. 656.

*Habitat* : Common on the margins of water holes.

## IX. PALME.

36. *Caryota urens* Linn., *F.B.I.*, VI, p. 422.

*Vern. Names* : *Ban-khajur* (Hind.) ; *Mari, Tar-mardi* (Tel.) ; *Berli* (Mar.).

*Habitat* : Frequently cultivated ; often found as an escape in many places below tank bunds, viz. in Pakhal and Yellunda, etc. Widely distributed throughout India from the Sikkim Himalaya and Assam to Ceylon.

*Uses* : Fine fishing-lines are made from the rachis of the long spadices. The root and stem are hollowed to make buckets for water. The pith is similar to sago and makes a nutritious porridge. A large quantity of toddy is yielded by the cut spadix. The leaves yield a good fibre which is used in making ropes, brooms, etc.

37. *Borassus flabellifer* Linn., *F.B.I.*, VI, p. 482.

*Syn.* :—*B. flabelliformis* Linn. (Palmyra Tree.)

*Vern. Names* : *Tar, Tad* (Hind.) ; *Potu-tadi* (for male plant), *Penti-tadi* (for female plant) (Tel.) ; *Tad* (Mar.).

*Habitat* : Though a native of Tropical Africa the Palmyra palm has run wild throughout India, and especially in the Dominions it occupies vast areas of waste lands forming pure forests or intermixed with the wild date-palm. An interesting feature is that, towards Telangana side, many of these palms come out from the middle of the trunks of *Ficus bengalensis*.

*Uses* : Many are the uses to which this palm is put and it is one of the most important and valuable of forest trees. The chief product is 'toddy'—the sap of the cut peduncles. Government derives a good revenue from this source, and these palms are strictly preserved for this purpose. The hard outer wood is employed in making reepers, rafters, posts, etc. The trunk split longitudinally and hollowed out is used for water channels, and in making canoes. The leaves are employed in making baskets, mats, fences, fans, etc. The fibre from the leaves is used in thatching, for tying bamboos, etc. The tender fruits 'Munjil' are eaten and are very much relished.

38. **Phoenix sylvestris** Roxb., *F.B.I.*, VI, p. 425.  
(Wild Date-palm.)

*Vern. Names* : *Khajur*, *Sandola*, *Sendhi* (for the sap), (Hind.) ; *Leta* (Tel.) ; *Shindi* (Mar.).

*Habitat* : Extremely common throughout the Dominions, especially on the Telangana side, forming a gregarious forest growth for miles.

*Uses* : The chief product is the sap 'Sendhi' (toddy) which brings a considerable revenue to Government, and as has been stated for *Borassus* these palms are also strictly preserved under the Excise Regulations. The trunk and leaves are put to much the same uses as those of *Borassus*. The fruit which is a very inferior kind of date is eaten.

39. **Phoenix acaulis** Linn., *F.B.I.*, VI, p. 426.  
(Dwarf Date-palm.)

*Vern. Name* : *Jangli Khajur* (Hind.).

*Habitat* : Not abundant. Found on dry hill-slopes, etc.

*Uses* : The leaves are employed for making mats, brooms, etc. The stem yields a pith-like sago. The fruit is eaten.

40. **Phoenix humilis** Royle., *F.B.I.*, VI, p. 426.

*Vern. Name* : *Adri ceta* (Tel.).

*Habitat* : Very common towards Warangal side.

41. **Phoenix dactylifera** Linn., Brandis' *Indian Trees*, p. 645.

*Vern. Name* : *Khajur* (Hind.).

*Habitat* : Cultivated to a very small extent in gardens.

*Uses* : The fruits are very much relished.

42. **Areca catechu** Linn., *F.B.I.*, VI, p. 405.  
(Betel-nut Palm.)

*Vern. Names* : *Supari*, *Supiari* (Hind.) ; *Poka* (Tel.) ; *Pung* (Mar.).

*Habitat* : Commonly cultivated in gardens.

*Uses* : The nuts 'Supari' are chewed with betel leaves 'Pan'. The seeds are used in turnery for small ornamental work, toys, etc. The sheaths of the leaves are made into hats on the Malabar Coast.

43. **Cocos nucifera** Linn., *F.B.I.*, VI, p. 482.  
(The Cocoa-nut Palm.)

*Vern. Names* : *Nariel* (Hind.) ; *Tenkai Kobbari* (Tel.).

*Habitat* : Although perhaps a native of Tropical America, the Cocoa-nut palm is cultivated in many parts of India, near the sea-side. It is cultivated to a small extent in gardens.

*Uses* : Too well-known to need detailed description. All parts of the plant are useful. 'Kopra' both fresh and dried is one of the important ingredients of Madras curries as well as those of Hyderabad. The oil is used in cooking and burning, and also for hair. It is also used in the manufacture of candles and soap.

44. **Livistonia chinensis** Br., *F.B.I.*, VI, p. 434.  
*Syn.* :—*Livistonia sinensis* Mart.

*Habitat* : Cultivated ; it is a Chinese and Japanese species.

45. **Calamus rotang** Linn., *F.B.I.*, VI, p. 447.  
(The Rattan-cane.)

*Vern. Names* : *Bet, Bed* (Hind.) ; *Betam* (Tel.).

*Habitat* : Out of the places so far visited by me I found this only in the Warangal District, along the Moruncha Channel, below the Ramappa tank. The quality of cane is rather inferior.

*Uses* : Being not quite strong it is fit only for making baskets, mats, blinds, etc.

## X. ARACEÆ.

46. **Amorphophalus campanulatus** Blume., *F.B.I.*, VI, p. 513.  
*Syn.* :—*Arum campanulatum* Roxb., p. 629.

*Vern. Names* : *Zamin-khand, Jungli-suram* (Hind.) ; *Suram* (Mar.) ; *Kanda-gudda* (Tel.).

*Habitat* : Apparently wild in the Kareemnagar District of Hyderabad, and Daulatabad from where specimens were sent to me. It is also cultivated.

*Uses* : The corm and the seeds are used as an external application for rheumatic swellings (local information). The corm is eaten after carefully washing and heating it.

47. **Pistia stratiotes** Linn., *F.B.I.*, VI, p. 497.  
(The Water-Lettuce.)

*Vern. Name* : *Jal-kumbhi* (Hind.).

*Habitat* : Very common in standing water.

*Uses* : Medicinal.

48. **Pothos scandens** Linn., *F.B.I.*, VI, p. 551.

*Habitat* : I have not seen it wild, but it is grown in gardens and is a favourite climber.

49. **Colocasia antiquorum** Schott., *F.B.I.*, VI, p. 551.

Syn. :—*Arum Colocasia* Willd., Roxb., p. 624.

*Vern. Names* : *Arvi*, *Cham-kure-ka-gudda* (Hind.) ; *Chama-kura*, *Chama-gudda* (Tel.).

*Habitat* : Cultivated extensively for its tubers. Medicinal.

The following are planted in gardens :—

50. **Alocasia** sp.51. **Aglaonema** sp.52. **Anthurium** sp.53. **Caladium bicolor**. There are several varieties of this species.

## XI. LEMNACEÆ.

54. **Lemna polyrrhiza** Linn., *C.F.B.P.*, II, Pt. V, p. 832.  
(Duck-weed.)

*Habitat* : Abundant in ponds, etc. after the rains.

55. **Wolffia michellii** Schleid., *C.F.B.P.*, II, Pt. V, p. 832.

*Habitat* : Minute floating plants in ponds and tanks.

## XII. ERIOCAULACEÆ.

56. **Eriocaulon sieboldianum** Sieb and Zuce., *F.B.I.*, VI, p. 577.

*Habitat* : In wet places near ponds and canals, etc.

## XIII. BROMELIACEÆ.

57. **Ananas sativus** Shult., *C.F.B.P.*, V, II, Pt. IV, p. 744.  
(Pine Apple.)

*Vern. Name* : *Anannas* (Hind.).

*Habitat* : Rarely cultivated here. (There are plants in the Botanic Garden, Osmania University).

*Uses* : Pine apple is very much relished. Vinegar is prepared, although on a very small scale from pine apples. Medicinal.

## XIV. COMMELINACEÆ.

58. **Commelina subulata** Roth., *F.B.I.*, VI, p. 369.

*Habitat* : Common throughout. Specimens were collected from the vicinity of the Osmania University at Adigmet.

59. **Commelina benghalensis** Linn., *F.B.I.*, VI, p. 370.

*Habitat* : Very common everywhere. It seems to prefer rather dry situations and hard 'morum' soil. Specimens were collected at Adigmet. It possesses underground flowers.

60. **Commelina paleata** Hassk., *F.B.I.*, VI, p. 372.

*Habitat* : Very common. Specimens were collected from Adigmet.

61. **Cyanotis tuberosa** Schultes., *F.B.I.*, VI, p. 386.

Syn. :—*Tradescantia tuberosa* Roxb.

*Habitat* : Very common round about Adigmet.

*Uses* : Medicinal.

62. **Cyanotis axillaris** Roem and Sch., *F.B.I.*, VI, p. 388.

Syn. :—*Tradescantia axillaris* Linn.

*Vern. Name* : *Golugandi* (Tel.).

*Habitat* : As common as the preceding species.

*Uses* : Medicinal.

Different species of *Tradescantia* are grown in gardens, particularly *Tradescantia zibrina* for its handsome foliage.

## XV. POTEDERIACEÆ.

63. **Eichhornia crassipes** Solms, Mayuranathan, p. 289.  
(The Water Hyacinth.)

Syn. :—*Eichhornia speciosa* Kunth.

*Habitat* : A common weed in tanks and canals.

64. **Monochoria vaginalis** Presl., *F.B.I.*, VI, p. 363.

Syn. :—*Pontederia vaginalis* Linn.

*Habitat* : Very common in most pools and canals, etc.

*Uses* : Medicinal.

## XVI. LILIACEÆ.

65. *Asparagus racemosus* Willd., *F.B.I.*, VI, p. 316.

*Vern. Names*: *Safed-musli*, *Shakakul* (Hind.); *Sima-shatavari*—for dry root (Tel.); *Shatawali* (Mar.).

*Habitat*: Quite common in forests, especially in the Warangal District.

*Uses*: Tuberous roots are pickled and shoots are eaten as vegetable by the villagers. Medicinal.

The following are cultivated as ornamental plants in gardens:—

66. *Asparagus plumosus*.67. *Asparagus nanus*.68. *Gloriosa superba* Linn., *F.B.I.*, VI, p. 358.

*Vern. Names*: *Bach-nag* *Nat-ka-bachhnag* (Hind.); *Bisha* (Beng.); *Kartikaikishangu* (Tam.).

*Habitat*: Spreading rapidly towards Vikarabad side amongst bushes and in forest, also met with in the forest on the Warangal side.

*Uses*: The flowers are used in Hindu festivals. Medicinal.

69. *Smilax macrophylla* Roxb., *F.B.I.*, VI, p. 310.

*Vern. Names*: *Jangli-ushbah*, *Chobchini*, *Kamurikal* (Hind.); *Guti*, *Gutwel* (Mar.); *Malait-tamara* (Tam.); *Konda-tamara*, *Silapu*, etc., (Tel.).

*Habitat*: Common in Aurangabad in the Ghat jungles, also in the Nizamabad District in forests where the author had seen it growing.

*Uses*: Medicinal.

70. *Smilax prolifera* Roxb., *Fl. Ind.*, III, p. 795, *F.B.I.*, VI, p. 312.

*Vern. Name*: *Kunda-gurratiga* (Tel.).

*Habitat*: Common in most forests.

71. *Urginea indica* Kunth., *F.B.I.*, VI, p. 347.

*Vern. Names*: *Kanda*, *jangli-piaz* (Hind.); *Kande* (Beng.); *Ranacha-kanda* (Mar.); *Nakka-vulli-gadda* (Tel.).

*Habitat*: Common throughout, especially in sandy situations.



*Uses* : The bulbs are said to be used by Hindus in the preparation of 'ashes of silver' which is employed in medicine.

**72. *Scilla indica* Baker., *F.B.I.*, VI, p. 348.**

*Vern. Names* : *Bhui-kanda* (Hind.) ; *Shirunari-vengayam* (Tam.).

*Habitat* : Common towards Warangal side in grassy places and scrub-jungle, also towards Golkonda Fort from where the specimens were obtained.

*Uses* : Medicinal.

**73. *Allium cepa* Linn., *F.B.I.*, VI, p. 337.  
(The common Onion.)**

*Vern. Names* : *Piyaz* (Hind.) ; *Vulli-gaddalu* (Tel.) ; *Kanda* (Mar.) ; *Vellu-vengazam*, etc. (Tam.).

*Habitat* : Cultivated all over.

*Uses* : Onions form the chief ingredient of almost all Indian curries.

**74. *Allium sativum* Linn., *F.B.I.*, VI, p. 337.  
(Garlic.)**

*Vern. Names* : *Lassun*, *Lahsun* (Hind.) ; *Velluli-talla-gadda* (Tel.).

*Habitat* : Cultivated for its economic importance.

*Uses* : Garlic like onion is also one of the chief ingredients of Indian curries. Medicinal.

The following are garden favourites : —

75. *Dracæna*, several species and varieties.

76. *Agapanthus umbellatus*.

77. *Frittilaria*, several species and varieties.

78. *Hemerocallis* (Dry Lily) several species and varieties.

79. *Convallaria majalis alba* (Lily of the valley).

80. *Richardia aethiopica* (Arum Lily).

81. *Asphodelus* sp.

82. *Yucca gloriosa* Linn.

## XVII. AMARYLLIDACEÆ.

83. **Crinum asiaticum** Linn., *F.B.I.*, VI, p. 280.

Syn.:—*Crinum toxicarium* Roxb., *Fl. Ind.*, p. 285.

*Vern. Names*: *Chindar*, *Kanwal* (Hind.); *Nag-davana* (Mar.); *Bodukanod* (Beng.); *Kesar-chettu*, *Lakshminarayan chettu* (Tel.).

*Habitat*: Cultivated in gardens.

*Uses*: The fresh root is officinal in the Indian Pharmacopœia.

84. **Agave americana** Linn., *F.B.I.*, VI, p. 277.

(The American Aloe.)

*Vern. Names*: *Rakas patta*, *bans-keora* (Hind.); *Chugamattu*, *Changu-nara*, etc. (Tel.).

*Habitat*: Originally a native of America, naturalized in many parts of India, and in Hyderabad it is planted as a hedge in fields, gardens, and along railway lines and village roads, etc.

*Uses*: A strong fibre is obtained from the leaves, useful in rope and mat-making. Medicinal.

85. **Agave cantala** Roxb., *Fl. Ind.*, II, p. 167.

*Habitat*: Commonly planted as a hedge.

86. **Polianthus tuberosa** Linn., *C.F.P.B.*, II, Pt. IV, p. 753.

(Tuberose Lily.)

*Habitat*: A garden favourite.

The following are less commonly cultivated, but are to be found in the Botanic Garden, Osmania University:—

87. **Alstroemeria** sp.

88. **Hippeastrum** sp.

## XVIII. DIOSCOREACEÆ.

89. **Dioscorea pentaphylla** Linn., *F.B.I.*, VI, p. 289.

*Vern. Names*: *Manda* (Mar.); *Pandigada* (Tel.).

*Habitat*: Very common in the 'Mulug' forests in the Warangal District from where the specimens were collected.

*Uses*: Medicinal.

90. **Dioscorea oppositifolia** Linn., *F.B.I.*, VI, p. 292.

*Vern. Name* : *Aratenga-tige* (Tel.).

*Habitat* : Like the preceding species very common in the 'Mulug' forests.

*Uses* : Medicinal.

91. **Dioscorea bulbifera** Linn., *F.B.I.*, VI, p. 296.

*Vern. Names* : *Zamin khand* (Hind.) ; *Chedu paddu dumpa* (Tel.).

*Habitat* : I have not seen it wild in the environs of Hyderabad, but it is said to be found towards Daulatabad, and in Kareemnagar District.

*Uses* : The flower spikes are cooked and eaten.

## XIX. IRIDACEÆ.

The following are grown in gardens :—

92. **Iris** sp.

93. **Anomatheca** sp.

94. **Antholyza** sp.

95. **Freesia** sp.

96. **Gladiolus** sp.

97. **Crocus sativus** Linn., *F.B.I.*, VI, p. 276.

*Vern. Names* : *Zafran, kezar* (Hind.) ; *Kunkum* (Tel.).

*Habitat* : Native of South Europe. Cultivated in Kashmir. Several experiments were made in Hyderabad on a small scale, and some of them have been quite successful. Experiments on a bigger scale are yet to be carried out to see its prospect from the commercial point of view.

*Uses* : Too well known as a favourite in colouring and imparting flavour to Indian sweets and some curries. Mullahs (priests) make a kind of ink to write charms with. Medicinal.

## XX. MUSACEÆ.

98. **Musa sapientum** Linn. (The Banana plant.)

*Vern. Names* : *Kela, Mouz* (Hind.) ; *Mouz, Kel* (Mar.) ; *Arthipundoo* (Tel.).

*Habitat* : Indigenous in Behar and the Eastern Himalayas, but cultivated here as in other parts of India for its fruit.

*Uses* : Apart from its economic use it is medicinal.

99. **Ravenala madagascariensis** Son., *F.B.I.*, VI, p. 198.  
(The Traveller's tree.)

*Habitat* : Rarely planted in gardens (e.g. in Public gardens and in the Botanic Garden, Osmania University, and probably elsewhere also).

The following are also grown in gardens :—

100. **Musa chinensis** Sweet., *C.F.P.B.*, II, Pt. IV.  
p. 742.

101. **Musa ensette** J. F. Gmel., *C.F.P.B.*, II, Pt. IV.  
p. 721.

102. **Strelitzia reginæ** Spr. syst. 1, p. 833.

## XXI. ZINGIBERACEÆ.

103. **Curcuma longa** Linn., *F.B.I.*, VI, p. 214.  
(The Turmeric plant.)

*Vern. Names* : *Haldi* (Hind.) ; *Paspu* (Tel.) ; *Alad* (Mar.).

*Habitat* : Commonly cultivated for its tubers.

*Uses* : The powder of dry bright yellow tubers is used in all our curries. Medicinal.

104. **Zingiber officinale** Zosc., *F.B.I.*, VI, p. 246.  
(The Ginger plant.)

*Vern. Names* : *Zangabil* (Arabic) ; *Adrak* (Hind.) ; *Sunti* (Tel.) ; *Ada* (Mar.).

*Habitat* : Commonly cultivated for its aromatic root-stock.

*Uses* : The aromatic fresh root-stock is pounded and used as a condiment in our curries. It is cut in slices and preserved in honey, and is supposed to be efficacious in excess of bile. Too well known in British and Indian Pharmacopœias to be detailed further.

105. **Costus speciosus** Smith., *F.B.I.*, VI, p. 249.

*Vern. Name* : *Kio* (Mar.).

*Habitat* : A common herb.

## XXII. CANNACEÆ.

106. *Canna indica* Linn., *F.B.I.*, VI, p. 260.  
(Indian Shot.)

*Vern. Name* : *Sarvajaya* (Sans.) ; *Kardali* (Mar.).

*Habitat* : Not wild, but is very commonly grown in gardens as an ornamental plant.

*Uses* : Medicinal.

## XXIII. ORCHIDACEÆ.

The following are cultivated in gardens :—

107. *Cypripedium* sp.

108. *Dendrobium* sp.

109. *Habenaria* sp.

110. *Vanda* sp.

111. *Peristeria* sp.

Although many wild epiphytic orchids have been seen and some of them collected, their identification is postponed till the actual flowers are seen.

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*Pennisetum typhoideum*, 75.  
*Peristeria*, 90.  
*Phoenix acaulis*, 81.  
*Phoenix dactylifera*, 81.  
*Phoenix humilis*, 81.  
*Phoenix sylvestris*, 81.  
*Pistia stratiotes*, 82.  
*Polianthus tuberosa*, 87.  
*Pontederiaceæ*, 84.  
*Pontederia vaginalis*, 84.  
*Potamogetonaceæ*, 75.  
*Potamogeton indicus*, 75.

## R

- Ravenala madagascariensis*, 89.  
*Richardia æthiopica*, 86.

## S

- Saccharum cylindricum*, 76.  
*Saccharum officinarum*, 76.  
*Sagittaria sagittifolia*, 75.  
*Scilla indica*, 86.  
*Scirpus articulatus*, 80.  
*Smilax macrophylla*, 85.  
*Smilax prolifera*, 85.  
*Strelitzia reginae*, 89.

## T

- Tradescantia axillaris*, 84.  
*Tradescantia tuberosa*, 84.  
*Tradescantia zebrina*, 84.  
*Triticum vulgare*, 79.  
*Typhaceæ*, 74.  
*Typha angustifolia*, 74.  
*Typha elephantina*, 74.

## U

- Urginea indica*, 85.

## V

- Vallisneria spiralis*, 75.  
*Vanda* sp., 90.

## W

- Wolfia michellii*, 83.

## Y

- Yucca gloriosa*, 86.

## Z

- Zea mays*, 79.  
*Zingiber officinale*, 89.  
*Zingiberaceæ*, 73, 89.

**Further contribution to the study of the Blood Parasites  
of the Indian Birds, together with a list of the  
Hemoparasites hitherto recorded.**

By I. FROILANO DE MELLO.

INTRODUCTION.

The first records on the blood parasites of the Indian birds are due to Sir Ronald Ross. From his Memoirs<sup>1</sup> we find that he examined the blood of pigeons, doves, paroquets, wild pigeons, finches, sparrows (*Passer indica*), crows (*Corvus splendens*), larks (*Calandrella dukhunensis*) and many of them were infected by protozoa belonging to the genus *Harmoproctus*. Every one is aware of Sir Ronald's work on the plasmodids of sparrows and the help that such studies gave for our present knowledge of human malaria.

The book of Wenyon gives a complete list of the hæmoprotezoa of the Indian birds<sup>2</sup>; one can see there how small is the number of researchers who have dealt with these forms: Stephens and Christophers, Acton and Knowles,<sup>3</sup> Adie,<sup>4</sup> Plimmer<sup>5</sup> and H. H. Scott, the last two authors carried out their researches on birds which had died in the Zoological Gardens of London.

In the list given below (*apud* Wenyon) the parasites found by Dr. Scott are marked with the letters Z.S., just as in Wenyon where they are recorded and from where these notes are taken.

I. PLASMODIDS RECORDED IN INDIAN BIRDS.

1. *Aidemosyna malabarica*. *Pl. precox*, Z.S., 1925.
2. *Antigone virgo*. *Plasmodium* (unnamed) Z.S., 1925.
3. *Chloropsis aurifrons*. *Pl. precox*, Z.S., 1925.
4. *Corvus splendens*. *Plasmodium* (unnamed) Donovan (1908 ?).
5. *Emberiza fucata*. *Plasmodium* (unnamed) Plimmer, 1913.
6. *Eulabes religiosa* (*Gracula religiosa*). *Plasmodium* (unnamed) Plimmer, 1912; Z.S., 1925.
7. *Garrulax leucolophus*. *Plasmodium* (unnamed) Plimmer, 1912.
8. *Liothrix luteus*. *Plasmodium* (unnamed) Z.S., 1925.
9. *Melophus melanicterus*. *Plasmodium* (unnamed) Plimmer, 1913.

10. *Merula bulbul*. *Plasmodium* (unnamed) Plimmer, 1915.
11. *Pratincola caprata*. *Plasmodium* (unnamed) Plimmer, 1916.
12. *Pycnonotus jocosus* (*Otocompsa emeria*). *Plasmodium* (unnamed) Plimmer, 1912.
13. *Sturnus menzbieri*. *Pl. precox*, Z.S., 1925.
14. *Tragopan satyra*. *Pl. precox*, Z.S., 1925.

*Remarks.*—We see that whilst Plimmer only recorded the existence of a *Plasmodium* in birds, Dr. Scott (who was assisted by Dr. Wenyon) has classified as *Pl. precox* all the plasmodiids found in his ornithological specimens. Studying the *Plasmodium* of *Chloropsis aurifrons davidsoni*,<sup>6</sup> I stated the reason why I do not agree with the classification of Dr. Scott : my *Pl. chloropsidis* which I believe to be the same as the *Pl. precox* registered by Z.S. as parasite of *Chloropsis aurifrons*, although having a general resemblance with *P. precox* Grassi and Feletti 1890, as far as it concerns the appearance of the rosettes and their irregular number of merozoites, possesses enough differential characters for maintaining its autonomy, remarkably by the compact structure of the chromatin in the nucleus of the merozoites, so totally different from the chromatinic ring which constitutes the nucleus of the real *precox* merozoites, which so often come under our observations.

The classification of bird plasmodiids, the so-called *Protozooma*, has followed many curious *étapes*, after the first period, when the species was described as autonomous according to the harbouring host, there was a tendency for grouping all bird *protozooma* in one single species, *Pl. precox*. The fact that one single strain of avian plasmodia can infect many species of birds gives a certain support for such classification (strains of sparrow plasmodiids inoculated with success in canaries, larks, goldfinches).

Shortly after, it was recognized that sparrows themselves are parasitized by more than one species of plasmodiids. Hartmann<sup>7</sup> differentiated on morphological grounds three parasites of sparrow malaria, Russel<sup>8</sup> a fourth one. In this connection it is interesting to refer to a recent paper by Giovannola<sup>9</sup> who tries to classify the bird plasmodiids in some groups, based on the following morphological characters : (a) the alteration of the infected cell ; (b) the form of the schizont ; (c) the form of the gametocyte ; (d) the character of the pigment in the gametocyte, and (e) the number of the merozoites.

Relying on these characters the author reduces all bird plasmodiids studied up-to-date to three groups with some subdivisions, viz. :—

*1st group* : Spheroidal gametocytes, nucleus of the parasitized red cell displaced by gametocytes and adult schizonts : 1. *Pl. precox* Grassi and Feletti 1890, syn. *Pl. relictum* Grassi and Feletti 1891, *Pl. inconstans* Hartman 1927 with granular pigment

parasite of *Passer domesticus* studied by Grassi and Feletti, *P. hispaniolensis* (Grassi and Feletti), *Alauda arvensis* (Grassi and Feletti), *Fringilla harrarabiura minor* (Katahira), idem (Kikut) *Turtur orientalis* (Ogawa); II—*Pl. cathemerium* Hartmann 1927 with rod-shaped pigment in the gametocytes, parasite of *Passer domesticus* (Hartmann).

To the same group belong—

*Pl. capistrani* Russel 1932 parasite of *Erculfactoria ineata*, immunologically different from *Pl. precox* and *Pl. cathemerium*, distinguishable only by having the pigment more abundant and constituted by large granules collected in one coniform extremity.

*Pl. wasilewsky* Brumpt 1909 parasite of *Athena noctua*, immunologically different from *Pl. precox* and having a smaller number of merozoites (10-12).

*2nd group.* Elongated gametocytes, nucleus of the parasitized red cell displaced by schizogony and slightly by gametocytes - *Pl. elongatum* Huff 1930 parasite of *Passer domesticus* (Huff), and *Carduelis carduelis* (Raffaele).

*3rd group.* Elongated gametocytes, nucleus of the parasitized red cell never displaced. This may be divided into two subgroups: I—Sub-group with schizonts small and quadrangular. *Pl. rouvi* Sargent and Catanei 1928 parasite of *Passer domesticus* with a definite number of 4 merozoites: *Pl. toum* Laveran and Marullaz 1914 parasite of *Liothrix luteus* (Lav. and Mar.), *Turdus merula* (Giovannola); II—Sub-group where the adult schizonts circumscribe the nucleus of the parasitized red cell: *P. circumflexum* Kikut 1931 parasite of *Turdus pilaris* (K.), *Turdus iliacus* (Giovannola); *Pl. fallax* Schwetz 1930 parasite of *Syrnium nuchale* (Sch.)

Such a classification absolutely premature, if destined to group on these lines all the bird plasmodids, is however a remarkable step as far as it concerns the non-identification of the bird plasmodids to *Pl. precox* as had been done before. The most we can accept is that some morphological types may be described in this way, but we are rather sceptical of such groupings as they do not correspond to the different modalities shown by the different species found in birds.

For example *Plasmodium centropi* parasite of *Centropus s. paterotti* Stresemann which we have described in a paper yet unpublished presented to the XII International Congress of Zoology held at Lisbon has: gametocytes spheroidal (1st group) and crescent shaped (2nd and 3rd group); nucleus always displaced (1st and 2nd group); pigment granular (type *precox*) and rod-shaped (type *cathemerium*). If we add to these characters, the falciform appearance of the gametocytes and the irregular appearances of the pigment, we could feel ourselves inclined to create a *fourth group* in addition to those created by Giovannola. In reality we think that, non-obstant more than

one bird being susceptible to the infection by a given plasmodid, as can only be confirmed by inoculations and cross immunity, every bird has generally its own plasmodium and sometimes more than one, just as it happens with man and other mammifera.

\* \* \*

To the note of the plasmodids of the Indian birds quoted above, we will add now those found in our own studies :—

15. *Herodias intermedius* Wagler.<sup>6</sup> *Plasmodium herodiadis*, *mihi*, 1935.

16. *Gallinula chloropus* L.<sup>6</sup> *Plasmodium gallinulae*, *mihi*, 1935.

17. *Chloropsis aurifrons davidsoni* Baker.<sup>6</sup> *Plasmodium chloropsidis* (Scott, 1925), *mihi*, 1935.

18. *Centropus* s. *parrotti* Stresemann. *Plasmodium centropi* sp. nov. *mihi*.

## II. HÆMOPROTEIDS RECORDED IN INDIAN BIRDS.

Very short remarks will be made here concerning the hæmoproteids. Every one knows that the schizogonic cycle of *Hæmoproteus* is described according to the researches of Aragão in *Hæmoproteus columbae* Celli and S. Felice<sup>11</sup> : an intracellular stage in a monocyte or endothelial cell giving rise to numerous infective small merozoites, specially found in internal organs. Studying *Hæmoproteus raymundi* parasite of *Leptocoma zeylonica* L., we have been unable to find any intracellular stage in the sections of the lungs and other organs. What we have found is a much more simple process of multiplication, consisting in the appearance of many free parasites, roundish or oval, uni- or multinucleated (we have been able to count up to 11 chromatic masses) which we interpret as free trophozoites giving by nuclear division, true rosettes resulting in merozoites or schizonts. These merozoites remain free among the red corpuscles in the interstitial spaces of the cellular trama, but never in the protoplasm of an endothelial cell or of a white mononuclear leucocyte. Sections of the spleen have also shown schizonts in the red corpuscles and free merozoites among them.<sup>12,13</sup>

The second point deserving attention is that concerning the so-called parthenogenetic division of the female gametocyte. Really, we sometimes find these gamonts showing two nuclear masses interpreted by some authors as the initial stage of further division. Prof. Brumpt<sup>14</sup> does not accept this view and explains such figures as a result of a mere fusing up, or an *accolement* of two parasites. In the course of our studies, sometimes, and specially in *Hæmoproteus sturni*<sup>15</sup> parasite of *Sturnus malabarica* Gemelin we have come across such *accolements*, where two male gametocytes and two female gametocytes had

their protoplasts fused together. In *Hæmoproteus glaucidii* parasite of *Glaucidium radiatum* Tickell we have even seen once one male and one female gametocyte fused together. But on the interpretation of such phenomena we prefer to keep a prudent reserve, stating for the present, that if there are evident cases where this *accolement* can be recognized, there are others where one single female gametocyte has been seen to possess two nuclei. Indeed we have not seen any figures of a further division suggesting an evident schizogony.

The last point requiring further investigation concerns the division of the female gamonts that have become free in the plasm, into two round parts: one containing the nucleus and the other devoid of any nuclear part. This has been frequently seen in *H. muruony* parasite of *Copsychus saularis* and lately in *H. raymundi*. Perhaps such phenomenon is related to some kind of sexual maturation, dividing the gamont into a true gamete (the nuclear cell) and an afertile element devoid of chromatin and containing only pigment.

*List of Indian Hæmoproteids apud Wenyon.*

1. *Antigone antigone*. H.Z.S., 1925.
2. *Athene brama*. H. Donovan, 1904.
3. *Caloenas nicobarica*. H.Z.S., 1925.
4. *Centropus sinensis*. H. Donovan, 1904.
5. *Chloropsis aurifrons*. H.Z.S., 1925.
6. *Cittocinclæ macrura*. H. Plimmer, 1914, 1917; Z.S., 1925.
7. *Columba livia*. H. columbæ Celli and S. Felice ant.
8. *Copsychus saularis*. *H. muruony* Mello and Sá, 1916.
9. *Coracias indica*. H. Plimmer, 1912, 1914.
10. *Corvus splendens*. H. Donovan, 1904.
11. *Dendrocitta vagabunda*. H. Plimmer, 1913.
12. *Fuligula bacri*. H. Plimmer, 1912.
13. *Garrulax albigularis*. H. Plimmer, 1913.
14. *Garrulus lanceolatus*. H. Plimmer, 1914.
15. *Glarcola pratincola*. H. Plimmer, 1913.
16. *Gymnorhis flavicollis*. H. Plimmer, 1913.
17. *Haliæctus leucoryphus*. H.Z.S., 1925.
18. *Maclophus Xantogenys*. H. Plimmer 1912.
19. *Melophus melanictus*. H. Plimmer, 1913.
20. *Mesia argentauris*. H. Plimmer, 1913.
21. *Nettopus coromandelianus*. H. Plimmer, 1915.
22. *Palaornis fasciata*. H. Plimmer, 1913.
23. *Propasser rhodochrous*. H. Plimmer, 1917.
24. *Tarrhaleus jerdoni*. H. Plimmer, 1913.

To this list we will add those found in our own studies. :—

25. *Corvus macrorhynchos*. H. Mello et alia, 1917.<sup>16</sup>
26. *Orthotomus sutorius*. H. Wenyoni. Mello et alia, 1917.<sup>16</sup>
27. *Machlolopus Xanthogenys*. H. machlolopi (Plimmer, 1912). Mello, 1935.<sup>6</sup>
28. *Leptocoma Zeylanica*. H. raymundi. Mello and Raimundo, 1934.<sup>12, 13</sup>
29. *Coracias b. benghalensis*. H. coraciae benghalensis. Mello and Affonso, 1935.<sup>17</sup>
30. *Gallinula chloropus*. H. gallinulae. Mello and Affonso, 1935.<sup>15</sup>
31. *Astur badius dussumieri*. H. asturis dussumieri. Mello, 1935.<sup>15</sup>
32. *Oriolus orilus Kundor* H. orioli. Mello and Rego, 1935.<sup>15</sup>
33. *Strix ocellata*. H. (unnamed). Mello, 1935.<sup>15</sup>
34. *Pastor rosus* H. pastoris. Mello, Rego and Affonso, 1935.<sup>15</sup>
35. *Theroceryx Z. inornatus*. H. therocerycis. Mello and Sirvoicar, 1935.<sup>15</sup>
36. *Theroceryx Zeylanica*. H. therocerycis var. Zeylanica. Mello, Lopes and Furtado, 1935.<sup>15</sup>
37. *Aegithina tiphia*. H. aegithinae. Mello and Sirvoicar, 1935.<sup>15</sup>
38. *Centropus parrotti*. H. centropi. Mello, 1935.<sup>18</sup>
39. *Platalea leucorodia major*. H. platatae. Mello, 1935.<sup>18</sup>
40. *Antigone virgo*. H. antigonis. Mello, 1935.<sup>18</sup>
41. *Upupa e. orientalis*. H. upupae. Mello and Affonso, 1935.<sup>18</sup>
42. *Cerchneis t. objurgatus*. H. (unnamed). Mello, 1935.<sup>18</sup>
43. *Elanus c. vociferus*. H. elani. Mello and Affonso, 1935.<sup>18</sup>
44. *Dicrurus m. macrocerus*. H. dicruri. Mello, 1935.<sup>18</sup>
45. *Tephrodornis p. pondicriana*. H. tephrodornis. Mello, 1935.<sup>18</sup>
46. *Otocompsa emeria*. H. otocompsae. Mello and Lopes, 1935.<sup>18</sup>
47. *Glaucidium radiatum*. H. glaucidii. Mello and Lopes, 1935.<sup>18</sup>
48. *Sturnus malabarica*. H. sturni. Mello, Rivoncar and Camotim, 1935.<sup>18</sup>
49. *Anthus r. rufulus*. H. anthi. Mello and Reveredo, 1935.<sup>18</sup>
50. *Halcyon smyrnensis*. H. halcyonis. Mello and Quenim, 1935.<sup>15</sup>
51. *Gymnorhis Xanthocollis*. H. gymnorhidis. Mello and Rego, 1935.<sup>15</sup>
52. *Athene brama*. H. bramæ. Mello and Curchorcar, 1935.<sup>15</sup>





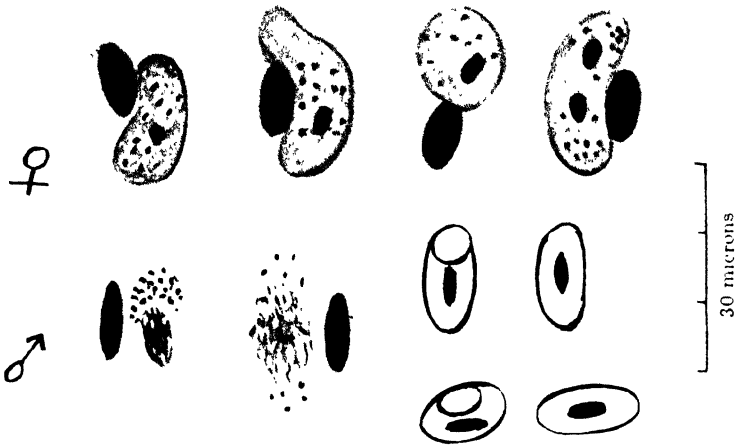


FIG. 1. Haemoproteus of *Erythra intermedia* Foister.



FIG. 2. Haemoproteus of *Lanius sch. erythronotus* Vigors.

*New Hæmoproteids found during our researches.*

53. *Egretta intermedia* Forster.—Shot at Salcete, identified by Mr. S. H. Prater, Curator, Bombay National History Society.

*Hæmoproteus* whose gametocytes show the sexual dimorphism of this genus. *Female gametocytes* with blue protoplasm (Leishmann Stain), alveolar, often vacuolated. Nucleus oval central or sub-central. Granules of pigment of black coffee colour generally spread all over the body: seldom collected on the centre, in some forms very scanty. Form very variable, haltheride or crescent-like, spheroidal or elliptic. We have seen some forms possessing two evident nuclei, not due to the *accollement* referred to by Brumpt and recorded also in this paper in some other *Hæmoproteids*. *Male gametocytes* with the protoplasm very slightly blue, generally colourless. Large nucleus without definite outline and constituted by chromatic masses which in some specimens occupy almost the whole body of the parasite. Pigment with granules located at poles, generally at both, but rarely only unipolar. One of the poles is sometimes more pigmented than the other. General form elliptical or spheroidal.

Red cell generally normal and not hypertrophied. Often deformed. Nucleus generally displaced to the periphery.

The infection of the bird was not very abundant.

*Egretta intermedia* Forster and *Herodias intermedius* Wagler are synonymous. Our *Hæmoproteus* is *H. herodiadis* Mello, 1935. Studied in collaboration with my pupil Fernando Lopes, it shows only slight differences: whilst the male gametocyte in our former specimen had a small central or sub-central nucleus, in this one the nucleus is large, without definite outline and occupies sometimes almost the whole body of the parasite. The distribution of the pigment being the same in both gametocytes of *H. herodiadis* differs in our actual *Hæmoproteus*, being all over the body in females and polar in males.

The female gametocytes of this *Hæmoproteids* have not shown the violet rings found in the former, but negative characters are, in such cases, not reliable for differentiation.

We consider therefore these differences mere variations in the morphology of the parasite which we identify with *Hæmoproteus herodiadis* Mello, 1935.<sup>6</sup>

54. *Theraciceryx viridis* Bodd.—Shot at Pondá, identified by Mr. S. H. Prater. Studied in collaboration with my pupil Narcinva V.S. Velingear. *Hæmoproteus* with the following characters: *Female gametocyte*.—Protoplasm vacuolated, blue with Romanowsky. Small nucleus, oval or spheric, central or subcentral often situated at one pole. Its constitution is sometimes granular where one granule is often more distinct than the others (Karyosome?). Pigment brown ochraceous, in granules scattered all over the body, often in denser clusters at the poles.

The granules have various sizes, being sometimes very minute, sometimes larger.

Form generally haltheridic.

*Male gametocyte*.—Slightly bluish, more generally colourless. Nucleus dust-like, sometimes very large and without definite outline, central or sub-central. Pigment in large granules generally located at the poles or along the margin. At the side of large granules there are sometimes others of more minute size.

Red cell hypertrophied. Nucleus displaced to the periphery when the parasite is somewhat grown up.

This hæmoproteus is with slight differences similar to the parasite of *Thereiceryx zeylanica* with which it will be identified. It is therefore the same as *Hæmoproteus thereicerycis* var. *zeylonica* Mello, Lopes and Furtado, 1935.

55. *Lanius sch. erythronotus* Vigors. —Shot at Pondá and identified by Mr. Prater of Bombay. Studied in collaboration with my pupil Narcinva S. S. Velingear, this bird is parasitized by an *Hæmoproteus* with the following characters: *Female gametocyte* haltheridic, staining blue and with large pigment granules irregularly scattered over the body. Nucleus not staining or staining very weakly with Leishmann's stain but well with May Grünwald-Giemsa. It is small, oval or triangular and generally sub-central. *Male gametocyte*, irregular haltheride, almost quadrangular. Protoplasm colourless or very light blue. Nucleus central, large, without definite outline and constituted by chromatic masses irregularly scattered and taking sometimes the disposition of a reticulum.

Pigment granules very minute, located at poles, not abundant.

Whilst the *female gametocytes* do not alter deeply the red cells, only hypertrophying and displacing the nucleus to the periphery when the parasite is fully grown up, the male gametocyte, even when young, gives to the red cell a peculiar deformation: rendering it almost quadrangular, as it is figured in the plate.

In birds of the genus *Lanius* many *Hæmoproteids* have been recorded by the authors. So, *Lanius bucephalus* (= *Cephalophoneus bucephalus*) with a *Trypanosome* and *Hæmoproteus* studied by Ogawa in Japan 1911; *Lanius collurio* (= *Ennecstonus collurio*) with a *Trypanosome* studied by Sjöbring 1899 in Sweden. *Hæmoproteus* recorded by Ziemann 1898 in Heligoland. Wasielewsky 1908 in Germany, Wulker 1919 in Macedonia; *Trypanosome*, *Hæmoproteus*, *Leucocytozoon* and *Plasmodium* by Böing 1925, Germany; *Lanius excubitor* with a *Trypanosome* Cardamatis 1910 Greece, *Plasmodium* Schaudinn (quoted by Prowazek, 1911) Germany, *Hæmoproteus* Danielewsky 1889 South Russia, Cardamatis 1909 Greece, Brothers Sergeant 1904 Algeria, Wulker 1919 Macedonia; *Trypanosome*, *Hæmoproteus*, *Leucocytozoon*, *Plasmodium* Böing 1925 Germany; *Lanius*

*minor* *Hæmoproteus* Danielewsky 1889 South Russia, Cardamatis 1909 Greece; *Lanius rufus* (= *Phoneus rutilus*) *Hæmoproteus* Danielewsky 1889 South Russia; *Lanius Schack* (= *Cephalophoneus schack*) *Hæmoproteus* Mathis and Léger 1910 Tonkin; *Lanius auriculatus* (= *Phoneus auriculatus*) *Trypanosome* A. & M. Leger 1914 Niger.

Our *Hæmoproteus* must be similar to the parasites recorded in other countries, remarkably near that of *Lanius schack* of Tonkin.

It is recorded for the first time in India, and as all these *Hæmoproteids* have not been named, we will baptize our parasite under the name *Hæmoproteus lani*, sp. nov.

### III. LEUCOCYTOZOONS RECORDED IN INDIAN BIRDS.

Some previous remarks are needed concerning the blood parasites actually classified as *Leucocytozoon*. First of all, this word, whose meaning as a generic designation has been erroneously attributed to Danielewsky, as rightly pointed out by Laveran,<sup>18</sup> was used by the Russian author as indicating only some unpigmented malarial parasites of birds included in cells supposed to be leucocytes. The paper of Danielewsky and its title are strongly suggestive of this statement.<sup>19</sup> He did not create any genus with the name *Leucocytozoon*, he spoke only of *Leucocytozoaires*, in a wide sense, referring to those parasites and their habitat according to his hypothesis.

Since then the word *Leucocytozoon* has been employed as a generic designation, but the differences of opinion on the exact meaning and nature, as well as on the cycle of these parasites and the nature of the host cell yet subsist and the problems concerning these points remain yet unsolved.

So, under the name *Leucocytozoon* are described two kinds of parasites: (a) the ones, elongated and contained in cells with spindle-shaped, fusiform points, the *cellules à cornes* of French authors; (b) the others of a round type, and whose harbouring cells never show the pointed appearances of the former.

Are they two species of parasites, or two stages of the same parasite? Wenyon<sup>2</sup> working with *L. naevii*, noted that 'whereas in fresh blood preparations all the parasites were in spindle shaped cells, in dried films, especially if made some time after the death of the bird, there was a much greater diversity of shape, many of the parasites being spherical while the cells appeared to have lost their tail like prolongation'.

Such is not the idea of Coles<sup>20</sup> who states that he has never seen the spindle-shaped *Leucocytozoon* and that this fact cannot be attributed to a later preparation of the blood films as they were taken at once, except perhaps in a few cases in which the bird had been dead some time, fixed by osmic acid vapour or even examined in hanging drop. 'In no case has there been any approach to the appearance of a spindle shaped body.'

Studying the Leucocytozoa of *Coracias b. benghalensis*<sup>17</sup> we have been fortunate enough to deal with this point. *Coracias b. benghalensis* is parasitized by both these kinds of Leucocytozoons with enough differential characters to individualize these two types and to reject the hypothesis of a possible transformation of one into another.

This autonomy of both types has not been unnoticed by other authors. Léger<sup>21</sup> has suggested that it would be convenient to designate these two forms under two generic different names. Unhappily his claims were founded, not on the morphology of the parasite, but on that of the host cell: 'la cellule hôte est dans certains cas un *hématoblaste*, dans d'autres cas un *mononucléaire*, jamais indifféremment l'un ou l'autre'. And certainly for this reason Léger himself and Mathis wrote later on<sup>22</sup>: 'distinguer deux catégories de Leucocytozoon suivant la nature de la cellule hôte parasitée, ce serait, à notre avis, prématuré'.

After a long study of Leucocytozoa we maintain that these types have enough characters for constituting two genera. For the first one the name *Leucocytozoon* (genotype *Consensu unanimo* *L. ziemannii*) should be kept, for the second one an independent genus should be created to which the name of Marcel Léger should be attached.

If we turn now our attention to the nature of the host cell, we see that the problem is far from having a solution. Léger<sup>21</sup> states that the host cell is sometimes an hematoblast, in other cases a mononuclear. Mathis and Léger<sup>22</sup> claim for the following formula: host cell fusiform-erythroblast, host cell roundish—mononuclear leucocyte. Danilewsky who, at first, thought that the host cells were degenerated leucocytes, later on considered them as hematoblasts. Sambon agrees with Mathis and Léger; Wenyon, Keysselitz, Mayer classify such cells as erythroblasts. Laveran and Lucet believe that the *L.* of the Turkey is included in white cells, Woodcock thinks that *L. fringillinarum* infects a mononuclear. França<sup>21</sup> classifies the host cell of *L. laverani* par. of *Garrulus glodarius* L. as a mononuclear leucocyte, that of the young forms of *L. mathisi* parasite of *Accipiter nisus* as an hematia. Léger finds the *L.* of *Corvus corax* in a lymphocyte, the *L. ziemannii* of *Asio accipitrinus* in an erythroblast.<sup>23</sup> Laveran and Marullaz<sup>18</sup> describe their *Hemameba liothricis* (*Leucocytozoon liothricis* apud Wenyon) in red cells.

We have not unhappily come to any definite conclusion upon this point. In *Coracias b. benghalensis* it seems that the host cell in both Leucocytozoa is of the same nature, differently deformed by the specific action of these types.

The same uncertainty prevails on the Schizogonic cycle of Leucocytozoa. The description of Fantham<sup>24</sup> has not been confirmed by others. Moldovan<sup>25, 26</sup> describes young schi-

zonts in lymphocytes or erythroblasts with 12-20, sometimes 30 nuclei (merozoites) in the organs, in acute and very heavy infections. It seems that Coles<sup>20</sup> has been happy enough to observe the divisional forms of the *Leucocytozoon* of the thrush. Such process has probably been found also by Knuth and Magdeburg in *L. anseris* in Germany. We have not worked on this point and cannot therefore give any opinion in this matter.

\* \* \*

We will now give the list of the *Leucocytozoa* of the Indian birds:—

*According to the list of Wenyon.*

1. *Athya brama*. *Leucocytozoon* (unnamed) Donovan, 1904.
2. *Falco* sp. *Leucocytozoon* (unnamed) Donovan, 1904.
3. *Janthocinclus rufigularis*. *Leucocytozoon* (unnamed) Z.S., 1925.
4. *Liothrix luteus*. *Leucocytozoon* (unnamed) Knowles, 1925.
5. *Oriocola ferrea*. *Leucocytozoon* (unnamed) Plimmer, 1913.
6. *Propasser rhodocrous*. *Leucocytozoon* (unnamed) Plimmer, 1917.

\* \* \*

Described by me in papers already quoted and presented to the Indian Academy of Sciences:—

7. *Chloropsis aurifrons davidsoni* S. Baker (6) *Leucocytozoon chloropsidis* Mello, 1935.
8. *Coracias b. benghalensis* (L.) *Leucocytozoon coracia benghalensis* Mello and Afonso 1935 (of the type *A. zimmermanni*): *Leucocytozoon* sp. (round type).

\* \* \*

Described by me in collaboration with some of my pupils in a paper presented to the XII International Congress of Zoology (September, 1935) and yet unpublished:—

9. *Oriolus oriolus kundoo* Sykes. *Leucocytozoon* sp.? Mello and Rego. Round type. Female gametocytes staining in deep blue with very small vacuoles, irregular in number. Nucleus ovoid, granular, rose. Male gametocyte with protoplasm light blue with large vacuoles, nucleus under the form of an irregular thread. It is perhaps similar to *L. anellobiae* Cleland 1912 (Australia) parasite of *Oriolus sagittarius* (= *Mimitta sagittata*).
10. *Oriolus xanthornus xanthornus* (L.). *Leucocytozoon* sp.? Mello. Round type. No sexual differentiation as in former

specimens. Great tendency to aberrant forms in contrast with the regular round type of *O. O. kundoo*. Nucleus either crescent like or irregular and very large in some specimens, oval with a chromatic line or point more deeply stained in others.

The very scanty infection of our bird does not allow of further remarks.

11. *Chloropsis jerdoni* Blyth. *Leucocytozoon chiriquisi*, sp. nov., Mello. Round type. It differs from *L. chloropsidis* in the following points. While in female gametocyte of *L. chloropsidis* the nucleus is roundish, or oval, rose or not stained, in *L. chiriquisi* it is roundish, ovoid or sausage-shaped and always well stained. The differences in male gametocytes are much more pronounced. In *L. chloropsidis* the nucleus is long, thread-like, irregular, stained violet. In *L. chiriquisi* the nucleus is very large, circular, occupying the most part of the parasite. Stained pale rose, dust-like, it is provided with a more deeply staining body, probably a Karyosome.

12. *Ardola gayii* Sykes. *Leucocytozoon ardola*, sp. nov., Mello. Round type. Protoplasm staining deep blue, more pronounced on the borders. Very minute alveoles. Nucleus circular, staining pale rose. Only five individuals seen, all of the same type and so no sexual differentiation could be made.

\* \* \*

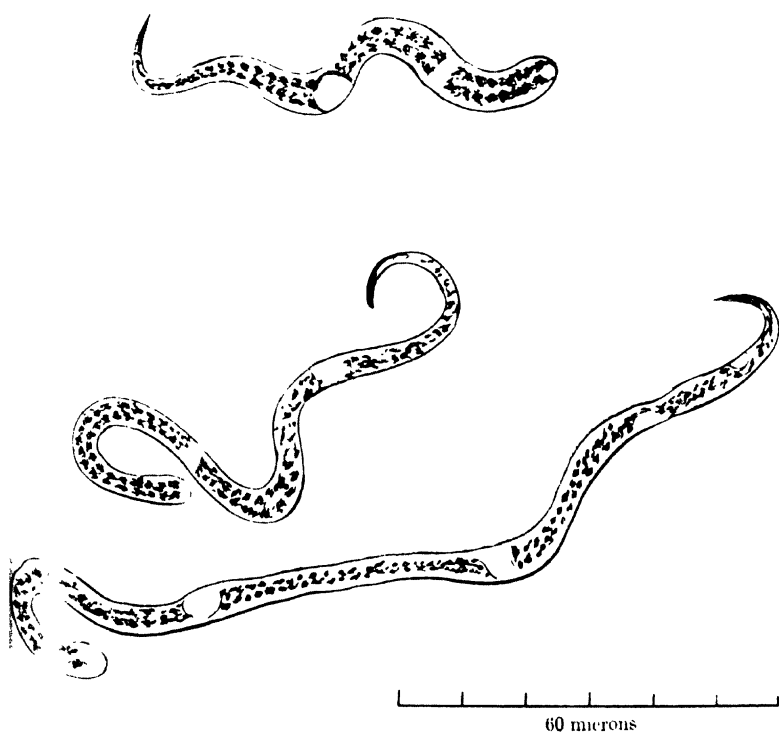
#### *New Leucocytozoon found in our actual researches*

13. *Molpastes c. cafer* (L.) (in collaboration with my pupil Narcinva V. S. Velingeir) --- This bird was shot at Pondá and was kindly identified by Mr. S. H. Prater, Curator Bombay National History Society. It is parasitized by a *Leucocytozoon* of the round type which is figured in the illustration. The protoplasm of both males and females is provided with very few minute vacuoles not giving therefore any specific character for a sexual differentiation. Entirely different is the structure of the nucleus. In female gametocyte it is circular, with a well marked membrane and a conspicuous central granule (Karyosome or rather centriole). In male gametocyte it is oval, rather elliptic and the chromatin is disposed in threads giving to the endosome various appearances figured in the schematic figure *a*.

Nothing can be said about the host cell. It shows the same nuclear constitution as in other parasites of this type. It is however very curious and worthy of note that *once only* one *Leucocytozoon* has been seen, *undoubtedly included in an hematia*. We definitely make this statement. This does not mean however that the normal host cell of this parasite is an hematia. Its nuclear reliquat is entirely different from the red cell nucleus and perfectly alike to the same structures seen in other *Leucocytozoon* of this type.



FIG. 1. Leucocytozoon and Microfilaria from *Volpertus h. haemorrhous* Guel.  
(a) nuclei of  $\sigma$ ; (b) sizes taken to camera lucida; (c) microfilaria







No parasite has been recorded in birds of this genus. We therefore baptize our *Leucocytozoon* as *L. molpastis*, sp. nov.

#### IV. TRYPANOSOMIDS OF INDIAN BIRDS.

The bird Trypanosomes are fully dealt with in Chapter XXX of the classical work of Laveran and Mesnil.<sup>27</sup> Till 1903 our knowledge of these parasites was due to Danilewsky, followed by the studies of Chalachnikow. Though first described in 1888 by the former, our more precise knowledge on the trypanosome of Danilewsky (*T. acutum* parasite of *Sylvium aluco*) is due to Laveran. Many birds have been found infected by Trypanosomes and some interesting facts concerning these parasites should be recorded.

- (a) Many birds which do not show any trypanosomes in microscopical examination, develop in the blood cultures flagellates belonging to Trypanosomids (Noxy Meneal,<sup>28</sup> França).
- (b) Often the trypanosomes are found in the smears of bone marrow when the blood smears are totally negative.<sup>29</sup> Laveran has however found sometimes just the opposite.
- (c) It seems also that the number of Trypanosomes in birds is subject to nyctemeral and seasonal oscillations varying according to the species.
- (d) The bird trypanosomes are essentially polymorphic.

#### *List of Trypanosomes of Indian birds apud Wengon.*

1. *Aluco brama*, *T. brama* Stephens and Crist., 1908 (Donovan, 1904).
2. *Caccabis chukar*, *T.* (unnamed) Plimmer, 1912.
3. *Cathocercus macrura*, *T.* (unnamed) Plimmer, 1914.
4. *Columba livia*, *T.* (unnamed) Hanna, 1903. Syn *T. hanna* Mello and Sá 1916 nec Pittaluga.
5. *Copsychus saularis*, *T.* (unnamed) Plimmer, 1912, 1913. found by Mello and Lopes, 1935 (XII International Congress of Zoology unpublished and named *Trypanosoma morioni* sp. n.)
6. *Corvus monedula*, *T. corvi*. Steph. and Crist., 1908.
7. *Corvus splendens*, *T.* (unnamed) Donovan, 1904.
8. *Dendrocitta vagabunda* = *D. refa*, *T.* (unnamed) Plimmer, 1913.
9. *Milvus forficatus*, *T. milvi* Steph. and Crist., 1908 Donovan, 1905.
10. *Nycticorax n. nycticorax*, *T. nycticoracis* Steph. and Crist., 1908—found also by de Mello (XII Int. Congr. of Zoology, 1935).

11. *Columba* sp. *T. columbae* Steph. and Christ., 1908 (Syn. *T.* unnamed of Hanna, *T. hannai* Mello and Sá 1916 nec Pittaluga).

\* \* \*

*Trypanosomes studied by the author and communicated to the  
Indian Academy of Sciences.*<sup>30</sup>

12. *Turdoides sommerillei*. *T. turdoidis* Mello, 1935.
13. *Centropus* s. *parroti*. *T. centropi*, Mello, 1935.
14. *Ixobrychus* m. *minata*. *T. isobrychi*, Mello, 1935.
15. *Lobivanellus* i. *indicus*. *T. lobivanelli* Mello, 1935.
16. *Cucullus micropternus*. *T. cuculli*, Mello, 1935

\* \* \*

*Trypanosomes found during our actual researches*

17. *Buteo calurus* Gloger. *T. sp.* This Trypanosome has been communicated to the XII International Congress of Zoology (yet unpublished). Infection very scanty, only three individuals found in five slides examined. Posterior end very pointed, rostrum like, the kintonucleus being situated 3.5 to 4 microns behind. It is surrounded by a very narrow vacuole, sometimes almost indistinct. Nucleus rather sub-central, circular or ovoid. Undulant membrane very visible with the axoneme taking a chromatic stain. It begins a little behind the kintonucleus and ends in a free flagellum, very thin but distinctly visible. The whole body stains very deep with Romanowsky. Measurements of the three individuals found:—

Posterior rostrum	4	3.5	4	micron
From the Kintonucleus to the nuclear membrane ..	18	12	13	..
Total length without the flagellum ..	40	30	40	..
Free flagellum ..	8	6	10	..
Breadth ..	3	3	3.5	..

Novy and Meneal have described *Trypanosoma mesnili* in *Buteo lineatus* (= *Buteo borealis*) 1905, North America, with the following measurements: length 50 microns, breadth 8. Kintonucleus at 7 microns of the posterior point.

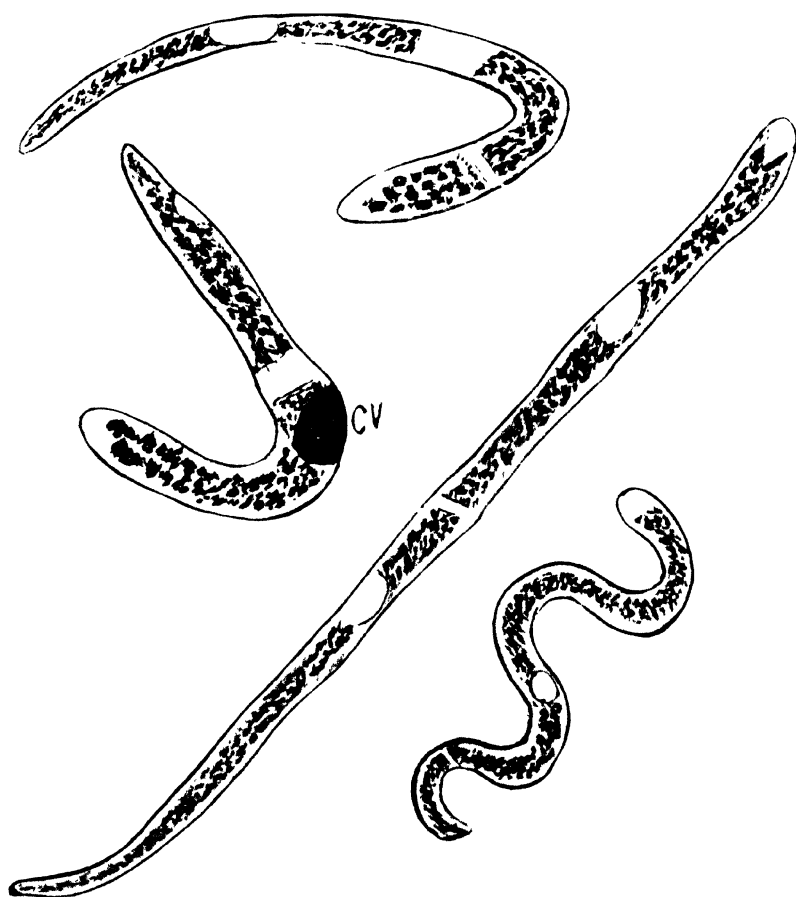
Our Trypanosome is much narrower than *T. mesnili*, but as the measurements of this trypanosome were taken on one single specimen and non-obstant the opinion of Novy and Meneal that in the blood of *Buteo lineatus* there is another species different from *T. mesnili* and identified by those American authors with *T. arium* (*apud* Lav. and Mesnil), we prefer not to name our species which will be registered only as *Trypanosoma* sp.

18. *Oriolus oriolus kundoo*.—During our actual researches we found in one young Oriole a trypanosome, from which only





FIG. 1. Trypanosome of *Orodolus ordis kurooo*



50 microns

FIG. 2. Microfilarium of *Turbulus macula nimanileus* Laf

one specimen was seen after a long examination of three blood smears (none in lung smears). It is interesting to note that many Orioles have been examined by us since last year without showing any Trypanosomes at all.

The general morphology agrees with the avian type. Posterior extremity pointed, rostrum-like. Kinetonucleus very conspicuous, lodged in an oval vacuole. Undulating membrane, starting from the kinetonucleus and having its axoneme with a chromatic tinge. Macronucleus slightly sub-central, more towards the anterior end, and having, in the only specimen examined the form of a triangular truncated band, stained in rose by Romanowsky and of granular constitution. Free flagellum very thin but distinctly visible.

Measurements: from the posterior point to the kinetonucleus 5 microns; from the kinetonucleus to the posterior margin of the macronucleus 12 microns; breadth of the macronucleus 2.5 microns; from the ant. margin to the anterior edge of the parasite 6 microns; free flagellum 8 microns; maximum breadth 5.5 microns.

Under the name *Trypanosoma anellobia* Johnston and Cleland have described a parasite of *Oriolus sagittarius* (= *Mimeta sagittata*) from Australia in 1912. As we have not found the characters of this trypanosome, we cannot identify our species which will be recorded here only as *Trypanosoma* sp.

#### V. TOXOPLASMIDS RECORDED IN INDIAN BIRDS.

We are dealing now with parasites of doubtful nature whose cycle and systematic position remain yet in obscurity. The first parasites of this type in birds were described in 1911 by Bearepaire Aragão.<sup>31</sup> Before them Laveran (1909) and Adie (1909) had described similar types in the sparrow and in *Pudla oriziorra* which were classified by Aragão as *hemogregarines* and named by him *H. adiei* and *H. pudla*. The parasites of the Brazilian birds were named *Hemogregarina atticaea*, *H. ramphocli*, *H. psoroaria*, *H. sporophila*, *H. tanagra*, *H. scutidis*, *H. brachyspiza* according to the bird harbouring them.

Nöller states that *Toxoplasma columba* Yakimoff and Kohl Yakimoff (1912) was probably the second record of this kind. Found by Carini in *Columba livia*, identified firstly with the *Toxoplasma* of dogs and rabbits, with which they have a great resemblance, later on found as a spontaneous parasite of pigeons. Yakimoff and Kohl Yakimoff gave it the specific name *Toxoplasma columba*.<sup>32</sup>

In India I found a parasite in the monocytes of pigeons, which I named *Leucocytogrigrarina franca*, referred by Nöller and by Wenyon to *Toxoplasma columba*. I recorded schizogony in

hepatic cells, more rarely in peripheral blood and bone marrow and at the same time a definite binary division where rudimentary kariokinetic figures could be demonstrated.

According to Wenyon, Hoare who has described a typical leucocytic hemogregarine in an Indian eagle (*H. adiei*), studying Aragão's description and examining his figures, believes that in all probability five of Aragão's birds actually harboured hemogregarines, while two (*Sporophila albicularis* and *Sicalis flarcola*) harboured true toxoplasmata. Wenyon (2, page 1086) adds: 'Aragão described a number of hemogregarines from South American birds. It has been assumed by Nöller and others that he was really dealing with toxoplasmata. The discovery by Adie on an undoubted hemogregarine in an Indian eagle led Hoare to study Aragão's paper. It was found that Aragão was probably dealing with two distinct types of parasites—toxoplasmata in two birds and hemogregarines in five. The parasite of the Indian eagle which was named *Hepatozoon adiei* closely resembles the leucocytic parasites of the dog, rat and other animals and it is probable that in five of his birds Aragão was dealing with a similar organism.'

Studying carefully the paper of Aragão we are absolutely convinced that all his seven parasites belong to the same type. All have the same morphology. If the differences pointed by Hoare and Wenyon are based on the schizogonic figures of *H. sicalidis* and *H. sporophila*, such figures are also seen in *H. brachispiza* (Aragão's fig. 76), although not in such an advanced stage as in the former.

What is the systematic position of these parasites? The expression *Leucocytoegregarina* Porter, used in generic sense by Sangiorgi (1912) for *L. musculi* which was recognized afterwards to be an *Hepatozoon* Miller 1908, has been rejected and it is generally accepted that the bird parasites we are referring to should be classified as *Toxoplasma* Nicolle Manceaux 1908, as claimed by Nöller. One must not forget that in *T. gondii*, the type species, Nicolle and Manceaux have described a paranuclear body, attached to the nucleus which is missing in the bird parasites.

The systematic position of these bird parasites is therefore very obscure: hemogregarines for Aragão, toxoplasmata for Marullaz, Nöller and others. Nöller has advanced another hypothesis after studying a so-called toxoplasm found in the spleen and liver of *Chrysomitris spinus* L.: that they may be merozoites of Coccidia inhabiting the intestine of this bird which was infected by male and female gametocytes and also by schizonts of an *Eimeria*. The schizonts occurred in the subepithelial tissues, together with merozoites and were also traced in the lymphatics going to the liver. So, it is not improbable, says Nöller, that the forms seen in the liver and spleen were in reality merozoites of the intestinal organism.

In *Fulica atra*<sup>33</sup> we have described a so-called *Toxoplasma* (*T. fulicæ*) which has very curious features : (a) firstly, there is no Coccidian parasite in the intestinal tract of this bird, and consequently the hypothesis of Nöller cannot be accepted in this case : (b) secondly, the parasites included in monocytes and multiplying by repeated binary division show tinctorial reactions suggesting a sexuality of the schizonts, a sexuality which seems to continue yet in the products of the division of the schizonts, or merozoites. A similar process of sexuality in agametes was described by Schaudinn in *Cyclospora caryolitica*. Our *T. fulicæ* seems to be a monocytic coccidium, closely allied to the family Cyclosporinæ.

After all these remarks one can see that the bird parasites we are referring to constitute a complex group of organisms which, only provisionally, can be classified as *Toxoplasmata*.

We will now give a list of the Toxoplasms of the Indian birds :—

*According to the list of Wenyon.*

1. *Pratincola caprata*, *Toxoplasma* (unnamed) Pilmmer, 1916.

To this we will add :—

2. *Columba livia* (domestic species) *Toxoplasma françæ* Mello, 1935. (Syn. *T. columbæ* Yakimoff and Kohl Yakimoff ?).<sup>34</sup>

\* \* \*

Communicated to the Indian Academy of Sciences :—

3. *Fulica atra*, *Toxoplasma fulicæ* Mello, 1935.

\* \* \*

Communicated to the XII International Congress of Zoology :—

4. *Butastur teesa*, *Toxoplasma butasturis*, sp. nov. Mello.—Different from the *T. fulicæ* as it has the protoplasm uniformly stained in pale rose and not showing the bitonal coloration suggesting sexuality as referred above. It resembles our *T. françæ* of the pigeon. Very few individuals seen : small parasites as the ring forms of Plasmodids, some larger schizonts with the nucleus more developed, evidence of binary division, often more than one parasite in the same cell.

## VI. MICROFILARIDS RECORDED IN INDIAN BIRDS.

In this chapter we are obliged to record only our own observations, as we had not at hand the literature dealing with such parasites studied by other authors. Our parasites have



not been named previously when only one sp. of *Microfilarium* has been found in the bird examined from that point of view, as we assume that the parasite will take naturally the specific name related to the host. When, however, more than one species has been recorded, we have given to them specific names. In this list we will characterize and name them according to the principles established above:—

1. *Herodias intermedius* Wagler. *Microfilarium herodiadis* Mello, 1935.<sup>6</sup>

2. *Chloropsis aurifrons davidsoni* S. Baker. *Microfilarium chloropsidis* Mello, 1935.<sup>6</sup>

\* \* \*

Communicated to the XII International Congress of Zoology:—

3. *Oriolus xanthornus xanthornus* (L.). *Microfilarium xanthorni*, sp. nov.—Roundish head, posterior extremity thinner, often pointed, often abruptly blunt. Sheath with transverse striation. Nuclear contents beginning at the head with two granules parallel or convergent and continued by nuclei so densely close one to another that it is quite impossible to individualize them as to distinguish the columns. Two spots, one split-like, the other, caudal, oval; however, many specimens where such spots are not visible. Central Viscus seems to be present sometimes. Breadth 5–7 microns. Length measured on 13 specimens: 60, 38, 42, 65, 50, 45, 58, 40, 36, 61, 46, 75, 78 microns (in collaboration with my pupil Xantarama Edó).

4. *Chloropsis jerdoni* Blyth.—Two specimens of this bird examined in collaboration, one with my pupil, V. V. Quenim, the other with my pupil, Narana L. Sansguiri, showed a *Microfilarium* with the following characters: provided with sheath without transverse striation, head roundish, tail pointed, sometimes slightly blunt, conical. Cellular contents disposed in two columns, beginning at 2 to 4 microns from the head where two or three nuclei are very distinct, rod shaped and disposed in an incomplete V. In the majority of specimens this double column may be followed till the central spot, which is very distinct. Cephalic split-like interruption sometimes visible. Central spot at 23–37 microns. Maximum breadth 4–7 microns. Length taken on 24 specimens 181, 156, 159, 111, 113, 108, 125, 124, 153, 124, 143, 114, 224, 138, 103, 155, 130, 145, 113, 131, 143, 129, 104, 97 microns. This *Microfilarium jerdoni* is different from *M. chloropsidis* parasite of *Chloropsis aurifrons davidsoni*, in the absence of the transverse striation of the cuticle which characterizes the last one. We name it *Microfilarium jerdoni*, sp. nov.

5. *Thereiceryx zeylanicus* (Gmelin).—This bird studied in collaboration with my pupil Fernando Lopes harbours in its blood two species of *Microfilaria*.

*Type A*.—Strongly curved, sometimes with the anterior half taking a spiral disposition. Anterior end round, posterior end pointed and followed by a tail-like flagellum of nearly 30 microns length. Very thin sheath. Nuclear contents beginning at 3-4 microns behind the anterior end in two columns disposed in V or U in their initial portion. One constant caudal spot, oval, at 80-90 microns from the head. Central Viscus not visible. Breadth 3, 5 to 4 microns. Length taken on 10 specimens 185, 186, 220, 191, 191, 205, 225, 205, 184, 184 microns. We have named it *Microfilarium jorgei*, sp. nov., in homage to Prof. A. R. Jorge, President XII. Int. Congr. of Zoology.

*Type B*.—More or less rectilinear, anterior end round, posterior one roundish blunt. Sheath very thin. Two nuclear columns beginning almost immediately behind the head. At nearly 30 microns from the head one longitudinal spot, split-like: central spot oval, at nearly 70-75 microns from the head. Breadth 3-4 microns. Length measured in 14 specimens 110, 97, 97, 92, 97, 106, 96, 100, 104, 100, 112, 103, 104, 91 microns. We name this type *Microfilarium thereicercis*, sp. nov.

6. *Dissemerus paradiseus malabaricus* (Latham).—Studied in collaboration with my pupil Emerciano Dias. Very abundant infection, showing in every microscopic field 5 to 6 microfilaria. Provided with sheath, anterior end rounded, posterior one pointed but blunt. Nuclear column beginning at 6-7 microns from the head. Nuclei disposed in two columns, sometimes three, irregularly interrupted here and there. One constant caudal spot situated at nearly 83-85 microns from the head. More or less irregular interruptions seen on cephalic and central portions. Breadth 5-7 microns. Length: 1 specimen 142: 5-160: 5-170; 1 175: 2-180: 2 190. We name it *Microfilarium dissemeri*, sp. nov.

7. *Dendrocitta rufa rufa* (Latham).—Studied in collaboration with my pupil Raia Sirvoicar.

8. *Dendrocitta rufa vagabunda* (Latham). Studied in collaboration with my pupil V. Visvonath Quenim.

Both these birds were parasitized by the same species of *Microfilarium* which we name *Microfilarium dendrocittæ*, sp. nov. Straight or slightly curved, anterior end round, posterior end pointed, fusiform. Nuclear contents beginning by two to four nuclei just behind the head and filling completely the body in order that the sheath is hardly visible. The nuclear columns are 2 or 3. One spot, generally circular, nearly at 45 microns from the head. Breadth circa 5 microns. Length measured in 24 specimens 80, 79, 82, 76, 78, 56, 65, 74, 77, 79, 80, 80, 74, 70, 78, 67, 70, 79, 69, 72, 74, 62, 76, 75 microns.

9. *Aegithina tiphia* (L.).—Studied in collaboration with my pupil Raia Sirvoicar. Microfilarium with anterior end blunt, and the posterior one pointed. Nuclear contents beginning at

10-12 microns from the head and filling the whole body. In the anterior part of the sheath, which is devoid of nuclei, some minute granules taking a chromatic stain are often noticed. Median spot either oval or V-shaped, fairly constant. One or two accessory spots on the post part. Central viscus a little behind the median spot. The irregularity of the number and of the situation of these spots characterizes this *Microfilarium*, which we name *M. ægithinæ*, sp. nov. Breadth 5-7 microns. Length 1-85 microns: 2-100: 1-105; 4-125: 1-145; 3-165; 1-175: 4-200; 1-215. Free part of the sheath before the head 3 to 9 microns. Free part of the tail, when present, 12-16 microns.

Two other specimens studied in collaboration with my pupil R. Sirvoicar and Hori Curchorear showed the same *Microfilarium*.

10. *Centropus s. parroti* Str.—Very scanty infection by a *Microfilarium*, only 4 parasites having been found in 7 slides examined. Provided with sheath, anterior extremity blunt, posterior one pointed, tail-like. Central viscus, very marked, under the form of a large granular band occupying the 2nd fifth of the body. It stains violet with Romanowsky in contrast with the uniform bluish colour of the body where no nuclei are distinctly seen. This constitutes a peculiar characteristic of this *Microfilarium*, whose body does not also show distinct spots. In the middle there is perhaps a slight V-like interruption and at the tail another, very incomplete: but these spots (?) also are not constant. Breadth 6-7 microns. Length 100-150 microns. We name this *Microfilarium centropi*, sp. nov.

11. *Centropus s. parroti* Str.—The *Microfilarium* of this bird is quite different from that described above. Sheath with transverse striation completely filled up with nuclei, which beginning some 10 microns behind the anterior rounded end, run into 3, sometimes 4 compact columns, till the posterior end which is abruptly truncated and has at the end a slight enlargement. In some specimens three distinct spots: one cephalic, not reaching the whole breadth of the parasite, one median of the same type, and one caudal, very large, quadrangular, constituting a complete interruption in the nuclear column. Central Viscus, when present, situated in the anterior third. We have named this *Microfilarium maccanni* sp. nov. in homage to Mr. C. W. McCann, of the Bombay National History Society.

12. *Nycticorax n. nycticorax* (L.).—*Microfilarium* with indistinct sheath. Anterior end blunt, posterior one pointed. Compact nuclear column, filling the whole body of the parasite and beginning shortly behind the anterior end by two nuclear masses disposed as a V. One central spot fairly constant but not reaching the whole breadth of the parasite. Central Viscus, when present, under the form of an oval body, stained blue with Romanowsky and situated a little behind the median spot. Breadth 6-7 microns. Length 60-95 microns.

We name it *Microfilarium nycticoracis*, sp. nov.

13. *Ardeola grayii* Sykes.—*Microfilarium* with a thin sheath provided with transverse striations. Head rounded, posterior end tail-like, abruptly pointed and the nuclear contents at this level contracted in the majority of specimens in the form of the biting sting of a scorpion. The nuclear column very compact, beginning a little behind the head by two distinct cellular groups. One constant central spot circular or V-like. Central Viscus not distinct however in one or two specimens it seemed to be present under the form of a crescent shaped body, located behind the central spot. Two other spots, one central, other caudal, not always constant and irregular either in their form or size, as sometimes the interruption reaches the whole breadth of the nuclear column, and sometimes not. Breadth 6-8 microns. Length: 2-57 microns: 4-65, 7-70, 15-75, 3-80, 5-85, 5-90, 5-95, 2-100, 1-104, 1-108, 1-119.

We name it *Microfilarium ardeolæ*, sp. nov.

14. *Streptopelia s. cambayensis* (Gmelin).—*Microfilarium* with a very thin sheet, with transverse striation hardly visible. Anterior end rounded and devoid of nuclei in some 10-12 microns of length but in this space two fine lines can be seen representing the two compact columns of nuclei which fill the whole body of the parasite. Three spots, cephalic, median and caudal, irregular in form and sometimes not complete. Central Viscus sometimes visible behind the median spot. Posterior end pointed but ending abruptly as a truncated cone. Breadth 6-7 microns. Length 160-236 microns.

We name it *Microfilarium streptopeliæ*, sp. nov.

15. *Acridotheres tristis tristis* (L.).—*Microfilarium* with sheath, the nuclear column beginning 5-6 microns behind the anterior end which is enlarged comparatively to the breadth of the body. The nuclear mass does not fill the body completely. The posterior end is either obtusely pointed or abruptly cut off and what is curious is that, despite the slides having been beautifully stained with Romanowsky, no separate nucleus could be seen in the body, the entire contents forming a compact mass, ribbon-like, irregularly twisted, where the spots are scarcely visible (one median, one caudal, not always visible). Central Viscus when present situated behind the median spot. Breadth 4-5 microns. Length 90, 100, 104, 118, 120 microns.

We name it *Microfilarium acridotheris*, sp. nov.

16. *Dicrurus m. macrocerus* Vie.—Very short *Microfilarium*, with roundish head and the posterior end possessing a small protuberance, curved as an appendix and very peculiar as it resembles perfectly the coecal appendix. Central spot oval or band-like; often a caudal spot. Nuclear column beginning three microns behind the anterior end. Two rows of nuclei. Breadth 5-6 microns. Length 68, 85, 71, 73, 66, 65, 74, 63, 69, 70, 50, 62, 60, 51 microns.

We name it *Microfilarium dicruri*, sp. nov.

17. *Pycnonotus luteolus* (Less.).—Studied in collaboration with my pupil Emerciano Dias. *Microfilarium* which has the peculiarity of not showing any spot at all, the nuclear contents very closely packed up in three columns and beginning quite near the head, one or two nuclei quite distinct and not filling the sheath at this level. Between the nuclei there are frequent small interruptions, not constituting however definite spots. Breadth 5, 5 microns. Length 74, 82, 79, 82, 70 microns.

We name it *Microfilarium pycnonoti*, sp. nov.

18. *Geocichla c. cyanotis* (J. & S.).—Studied in collaboration with my pupil António Reveredo. *Microfilarium* with the anterior end rounded, posterior one pointed, sometimes ending in a very thin point. Nuclear contents beginning at 1–3 microns, from the head, and disposed in 2 or 3 columns, often very closely fused together. One caudal spot, well marked. Some other interruptions, 1 to 3, whose situation varies according to the specimens, but generally in the middle and posterior part. General morphology rectilineal or more or less curved. Breadth 4–6 microns. Length 77, 66, 60, 73, 65, 67, 57, 56, 82, 70, 79 microns.

We name it *Microfilarium geocichlae*, sp. nov.

19. *Geocichla citrina* (L.).—Studied in collaboration with my pupil Alberto de Mello Furtado, this bird harbours three types of *Microfilaria*.

(a) Type I. Perfectly similar to the above described with the only difference that in some specimens three spots (median, posterior and caudal) are often visible.

This parasite is therefore the *Microfilarium geocichlae* described above.

(b) Head irregularly roundish, narrower than that of the type (a). Two rod-like nuclei at a short distance from the head. Tail pointed, very narrow, curved. General morphology regularly sinuous. Two nuclear columns. Two spots very distinct, one cephalic, the other caudal.

In some specimens Central Viscus behind the first spot, but not very distinct. The nuclear columns are very close to the sheet which is perfectly visible at the cephalic region. Rare specimens with a third median spot. Breadth 4 microns. Length 93, 106, 95, 123, 114, 102 microns.

We have named this parasite *Microfilarium herculani*, sp. nov. in honour of Prof. Herculano de Sá, of the Seth Gordandas Sunderdas Medical College of Bombay.

(c) This is the largest *Microfilarium* hitherto found in our studies. Head large, recurved, with one or two granules. Sheath very large, the nuclear contents in two columns often very closely packed up and forming a narrow, sinuous ribbon, running in the interior of the sheath which is not at all filled by the nuclear contents. Sometimes, due probably to bad stain-

ing, the nuclei are scarcely visible and the whole of the parasite seems uniform with one or more areas irregularly stained. Three spots; cephalic, median, caudal. Tail pointed. Breadth 7-8 microns. Distance from the head to the different spots: to the cephalic circa 40 microns, to the central circa 82, to the caudal circa 131. Length 264, 294, 325, 304, 242, 330 microns.

We have named it *Microfilarium prateri*, sp. nov. in honour of Mr. S. H. Prater, Curator, Bombay National History Society.

20. *Anthus r. rufulus* Vie.—Studied in collaboration with my pupil António Reveredo, this bird harbours three species of *Microfilaria*.

(a) Head roundish, posterior end pointed and provided with an appendage similar to the biting nail of a scorpion. Nuclear contents beginning as two nuclei just behind the head, one of them generally very close to the sheath. Two, rarely three columns of large nuclei, filling completely the interior of the sheath, so closely packed up that it is often difficult to distinguish them separately. Median and caudal spots fairly visible. Cephalic spot often present but not so regular. General morphology: straight or more or less sinuous with the tail sometimes curved. Distances from the head to the median and caudal spots generally 47 and 64 microns. Breadth 5.5-6 microns.

Length 74, 80, 78, 76, 73, 70, 69, 61, 65, 75, 79 microns.

We name it *Microfilarium anthi*, sp. nov.

(b) Head elliptic, tail blunt, conical. Nuclear contents beginning just behind the head, as two rod-like granules united to the sheath and continuing with two columns of small nuclei very closely packed up and filling completely the interior of the sheath. Two spots: one cephalic, split-like, the other caudal. General morphology more or less rectilinear or gently curved. Average distance from the head to the cephalic split-like spot 32 microns; to the caudal spot 74 microns. Breadth 3.5-4 microns. Length 111, 108, 109, 112, 94, 107, 95, 95, 97, 99, 110, 125 microns.

We have named *Microfilarium prashadi*, sp. nov. in honour of Dr. Baini Prashad of the Indian Museum, Calcutta.

(c) Curved, sinuous or S-like. Roundish head where the two nuclear dots make a kind of hernia not allowing clearly to individualize at this level the outline of the sheath. Posterior extremity fusiform, but somewhat blunt. Nuclear contents disposed in two, rarely three columns often fused together in one single rank very close to the sheath. Spots often not visible, sometimes one median and one caudal, not attaining the whole nuclear column. Breadth 3.5 microns. Length 52, 58, 57, 54, 53, 45, 56, 55, 32, 46, 50, 48, 45 microns.

We have named it *Microfilarium horai*, sp. nov. in honour of Dr. S. L. Hora of the Indian Museum, Calcutta.

21. *Saxicoloides fulicata* (L.).—Studied, in collaboration

with my pupil Quensova M. Bandari, this bird showed a large *Microfilarium* provided with a sheath and having the head roundish, the tail pointed, the nuclear contents in three columns just behind the head and ending in the tail in a thin nuclear mass with constant transverse interruptions. Three spots, cephalic, median and caudal, not reaching the whole mass of the nuclear contents. Another very interesting fact is that the nuclear contents are often contracted in a thin ribbon-like band, leaving between it and the walls of the sheath a large free space. Rectilineal or more or less sinuous. Cephalic spot at 33 to 52 microns from the head. Breadth 9 microns. Length 180, 117, 140, 125, 208, 231, 146, 235, 211, 132, 150, 162 microns.

We name it *Microfilarium saricoides*, sp. nov.

22. *Copsychus saularis* (L.).—In collaboration with my pupil Fernando Lopes I found in this bird a more or less sinuous *Microfilarium*, with roundish head where two granules mark the beginning of the nuclear mass: posterior extremity having a caudal, very effiliated appendix, of some 32 microns in average. Two nuclear columns. Three spots, often not very distinct, situated at *circa* 47, 89, 110 microns from the head. Breadth 3-4 microns. Length 177, 163, 211, 168, 194 microns. Length of the tail 31, 30, 28, 30, 35, 37 microns.

This *Microfilarium*, which was also found in another specimen studied in collaboration with my pupil Alberto P. L. Affonso has been named by us *Microfilarium moruoni*, sp. nov.

*Second type*.—In the specimen, studied together with my pupil A. P. L. Affonso, we have found another type of *Microfilarium* with the following characters. Sheath prolonged beyond the caudal pole of the nuclear mass, forming an appendage of nearly 30 microns and having the appearance of a glove finger. This constitutes the principal characteristic of this parasite. Nuclear mass beginning by two granules and not filling the whole breadth of the parasite, so that there is a large space between the nuclear mass and the wall of the sheath. Nuclear columns two, nuclei very closely packed up. In well developed specimens two split-like spots, cephalic and caudal and one median oval spot not reaching the whole mass of nuclei. The cephalic pole may also show sometimes a small sheath appendage where some granules and fibrils, lightly stained, are visible, in contrast to the quite clear zone of the caudal appendage. Breadth 5 microns. Length 139, 130, 86, 103, 125, 151, 160, 177 microns. Caudal glove finger appendage 18 to 45 microns. Cephalic appendage 4 to 20 microns.

We have named it *Microfilarium copsiyci*, sp. nov.

23. *Lalage melaschista* (Hodg.).—Studied in collaboration with my pupil Fernando Lopes. *Microfilarium* having a roundish head with two granules often united under the form of an U. Posterior extremity often pointed in a short point, often blunt. Nuclear contents in two columns (often three distinctly visible at

the anterior extremity). One constant split-like spot at 36 to 60 microns from the head, according to the specimens. Cephalic spot, when visible, at 20-25 microns from the head. Caudal spot rarely seen. Some specimens with the Central Viscus of Manson situated rather on the posterior part at some 55-60 microns from the head. Breadth 4-5 microns. Length 69, 82, 85, 57, 72, 103, 96, 98, 110 microns.

*N.B.*—Three specimens were found with the posterior extremity as rounded as the head. One of these specimens showed only one spot at 62 microns; the other two 2 spots. Length 79, 62, 50 microns. As the posterior extremity of the *Microfilarium* shows a great polymorphism, we believe that these three forms are only morphological variations of the same species which we name *Microfilarium lalagei*, sp. nov.

\* \* \*

*Microfilarids found during our actual researches.*

(See Plates 2 and 3.)

24. *Molpastes cafer* (L.).—Studied in collaboration with my pupil Narcinva V. S. Velingear.

Small and large *Microfilarium* with sheath and nuclear contents in two columns well marked on the head which is roundish. They are afterwards very closely packed up and interrupted by three spots: one cephalic, one caudal, both not reaching the whole mass of the nuclear contents and one median, split like, complete, and more constant than the former. Posterior extremity pointed, often very narrow. Breadth 7-8 microns. Length 50-60 microns.

We name it *Microfilarium molpastis*, sp. nov.

25. *Turdus merula nigropilvus* Laf.—Shot at Nagoa (Salcete) and identified by Mr. S. H. Prater. Studied in collaboration with my pupil Miss Ciriaca Vales. *Microfilarium* with rounded head and blunt tail. Nuclear contents beginning at 3 to 4 microns from the head and disposed in two, sometimes three columns, often in V on the initial portion. Number and form of the spots variable: in general there are three spots, one cephalic, one median, one caudal, often oval, often split like. Central Viscus when present, in front of the median spot. Maximum breadth 3-6 microns. General form rectilineal, rarely sinuous. Length 1-110 microns: 3-115; 2-120; 2-130; 1-140; 3-145; 1-150; 1-160; 1-170; 2-180; 3-190; 2-200.

We name this *Microfilarium merulae*, sp. nov.

26. *Monticola solitaria pandoo* Sykes, (studied in collaboration with my pupil Narcinva V. S. Velingear).

The *Microfilarium* of this bird shows the peculiarity of possessing a varied number of spots. Sheath without transverse striation. Nuclear contents in two distinct columns, beginning shortly behind the anterior end which is roundish. Posterior end pointed, more or less blunt sometimes, and con-



stituting a short tail. Cephalic spot, often split like, central spot, generally oval, both these spots being constant. We have found 3 specimens with 5 spots, 2 with 4 spots. Breadth *circa* 7 microns. Length 98, 122, 155, 170, 142, 181, 163, 169, 181, 199 microns.

We name it *Microfilarium monticolæ*, sp. nov.

\* \* \*

## VII.

During this work many birds did not show any parasites at all. This does not mean, indeed, that they are free of blood parasites: many specimens were negative, whilst others, belonging to the same species were infected.

The negative birds are here recorded merely to show the work accomplished for this paper which, to a certain extent, gives a contribution too for the study of ornithological fauna in Portuguese India.

*Indian birds which did not show any blood parasite at all.*

- (1) *Demicretta asha* (Sykes).
- (2) *Numenius p. phaeopus* (Linn).
- (3) *Tringa hypoleucos* Linn.
- (4) *Larus genç i* Breme
- (5) *Egretta alba alba* (Linn).
- (6) *Phænicornias minor* Geoff.
- (7) *Nettion crecca crecca* (Linn).
- (8) *Spatula clypeata* (Linn).
- (9) *Leucopoliis a. alexandrinus* (Linn).
- (10) *Elathea jocosa* Gestel.
- (11) *Tchitrea paradisi paradisi* (Linn).
- (12) *Graucalus m. macei* Less.
- (13) *Eremopterix grisea* Kaup.
- (14) *Xantholæma haemacephala lutea* (Lesson).
- (15) *Merops o. orientalis* Latham.
- (16) *Erolia m. minuta* (Leisler).
- (17) *Chaptia arnea malayensis* A. Hay.
- (18) *Merops superciliosus jaranicus* Horsfield.
- (19) *Streptopelia chinensis suratensis* (Cmelin).
- (20) *Tringa glareola* Linn.
- (21) *Saxicoloides fulicata cambaiensis* Latham.
- (22) *Pellorneum ruficeps* Swainson.
- (23) *Merops superciliosus* Linn.
- (24) *Chaptia arnea* (Vieillot).
- (25) *Haliastur indus* (Bodd.).
- (26) *Alcedo atthis* (Linn).
- (27) *Chrysocolaptes guttacristatus* (Tickell).

- (28) *Dicrurus caeruleus* (Linn).
- (29) *Cryptoplecton erythrorhynchum* (Sykes).
- (30) *Irena puella* (Lath).
- (31) *Dendrophasa bicincta* (Jerdon).
- (32) *Pericrocotus speciosus* (Latham).
- (33) *Dicaeum minullum* Swinhoe.
- (34) *Xantholæma malabarica* (Blyth).
- (35) *Æthiopsar fuscus* (Wagler).
- (36) *Hypothymis azurea sykesi* (Baker).

All these birds were identified by Mr. Prater or Mr. McCann, of the Bombay National History Society, to whom my best thanks are here expressed.

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## **The clitellum and sexual maturity in the Megascolecinae.**

By G. E. GATES and MAUNG HLA KYAW.

In the Oligochaeta specific characterization rests largely on the sexual organs. If these organs are not fully developed in the systematist's specimens, inadequate or even erroneous specific diagnoses may result. The clitellum which is present in sexually mature individuals has therefore been regarded as of considerable importance to the taxonomist as an indication of the sexual maturity of his material.

In earthworms of the subfamily Megascolecinae, presence of spermatozoa in the seminal chamber of a spermathecal diverticulum is indicated by an iridescence that is visible through the thin wall of the chamber. Spermathecal spermatozoa are always received (so far as is known) from another worm during the course of a copulatory act. The iridescence is, accordingly, evidence that copulation has taken place. But, iridescent seminal chambers are occasionally found in aclitellate individuals. In these worms the sexual organs are mature and we have, apparently, mature though aclitellate specimens. Such worms either copulated in an aclitellate condition (the clitellar glandularity still undeveloped when the worms were killed) or else the worms copulated in a clitellate condition, after which the clitellum disappeared.

In an attempt to discover if the second alternative is a correct explanation, observations have been made on several Rangoon species of Megascolecinae in which clitellar regression takes place under laboratory conditions. Hitherto only one species, *Pheretima posthuma* (L. Vaillant) 1868, has provided any evidence of especial interest.

A number of clitellate specimens of *P. posthuma* were collected in the neighbourhood of the University on the fifteenth of August. Of these worms 28 were killed and preserved by the usual technique while the remainder were placed in large, earth-filled pots, one worm in each pot. A fortnight later the clitellar region of the worms in the pots was much less distinct and on the clitellar segments setae were readily recognizable without a lens. Four and five weeks after the beginning of the experiment the worms were killed and preserved by the usual methods.

No clitellar glandularity is recognizable on the experimental worms. Intersegmental furrows 14/15 and 15/16 are visible, dorsal pores on the clitellar furrows are either present or represented by pore-like, possible non-functional markings. Setae are present ventrally and laterally but are lacking dorsally. The

female pore cannot be identified though its site is marked by a tiny, transversely placed depression. Colouration of the clitellar segments is slightly different from that of the neighbouring segments and this colouration together with the absence of setæ dorsally distinguishes the post-sexual condition of segments xiv to xvi from the juvenile or pre-sexual condition.

Of the 28 worms killed at the beginning of the experiment each specimen is characterized by an iridescence of every seminal chamber. In view of this uniformity it seems fair to assume that all of the experimental worms had copulated prior to capture. In one of the experimental animals each seminal chamber is characterized by a spermatozoal iridescence. In two other worms each seminal chamber is filled with an opaque, whitish material with no iridescence. In another specimen the seminal chambers are translucent. In the last worm, which was killed several days later than those just mentioned, the seminal chambers are all transparent.

Thus, in at least one species of the *Megascolecinae*, spermatozoa can be retained within the seminal chambers unmodified or sufficiently unmodified to produce the iridescence until after the clitellar glandularity has disappeared.

The non-iridescent opacity, translucence and transparency of the contents of the seminal chambers are indications of changes presumably of a digestive and absorptive nature taking place within the chamber. The chamber does not appear to undergo any noteworthy change in size and shape during the process of spermatozoal digestion.

Published accounts of copulation tend to indicate that only clitellate individuals actually participate in the sexual act, and further evidence for such a belief is afforded by the observations on *Pheretima posthuma* just mentioned. But copulation has been studied in only a few species and in only one *Megascolecine* form (a species of *Pheretima*). It would be premature, therefore, to deny that acitellate individuals can copulate, especially since the primary function of the clitellum seems to be the formation of cocoons, a post-copulatory act.

In contrast to the condition just discussed, in certain species of *Pheretima*, clitellate specimens have occasionally been found in which the testes are undischarged or juvenile while the seminal vesicles are rudimentary, juvenile or entirely lacking. In this case there is no possibility of a post-sexual regression of the sexual organs and we have fully clitellate but sexually immature specimens (at least so far as the male organs are concerned). Such specimens usually are heavily infested with gregarines or show evidence of having been so infected. (*Note.*— The parasites are not in, or even near, the organs affected.) In spite of the heavy infestation the hosts are of normal size or may even be unusually large and apparently, at least so far as external appearances are concerned, quite healthy. In these worms the

parasites appear to have been responsible for the inhibition or restriction of development of the sex organs without affecting the development of the clitellum.

Avel (*C.R. Soc. Biol. Paris*, Vol. 96, 1927 and *C.R. Ac. Sci. Paris*, Vol. 186, 1928) has shown that the clitellum in certain species of Lumbricidæ can develop in the absence of the gonads, both testes and ovaries. Avel concludes (according to Stephenson, 1930, p. 404) that the appearance of the clitellum as a secondary sexual character is dependent on a particular condition of the body fluids. If the parasites in the genus *Pheretima* can affect the host through the body fluids in such a way as to inhibit development of certain sex organs, at the same time permitting the development of others, and in particular the clitellum, a similar interference with the developmental processes should be possible experimentally.

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**The Alimentary Canal of *Epilachna indica* (Coccinellidæ : Coleoptera) with a discussion on the activity of the mid-gut epithelium.**

By S. PRADHAN.

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# 1. INTRODUCTION

The investigation of alimentary canal of *Epilachna indica* was taken up in connection with a more comprehensive work on a comparative study of the alimentary canals of carnivorous and herbivorous beetles of the family Coccinellidæ (Coleoptera), but as the study of *E. indica* revealed a large number of both structural and physiological peculiarities which are important from the view-point of digestion among insects in general, I am publishing this account separately. The alimentary canal of another species of *Epilachna*, i.e. *E. corrupta* has already been described by two American workers, Potts (1927) and Burgess (1932) ; but unfortunately the accounts of these two investigators differ from each other, and my own findings on *E. indica* differ in important respects from those of both of these authors on *E. corrupta* ; I am therefore presenting my results in an extended form.

## 2. THE COURSE OF THE ALIMENTARY CANAL.

The alimentary canal of *E. indica* (fig. 1) is a convoluted tube about three times the length of the body of the insect.<sup>1</sup>

<sup>1</sup> As the insect shows sexual dimorphism in its size, the length of the gut also varies in the two sexes, being 3 cm. in the case of the female and only 2.75 cm. on the average in the male. However, the ratio between the length of the insect and that of its alimentary canal in the two sexes remains almost the same.



Like the typical gut of an insect, it consists of three main divisions—the fore-gut, the mid-gut, and the hind-gut of which the second division is the longest in this species. The gut

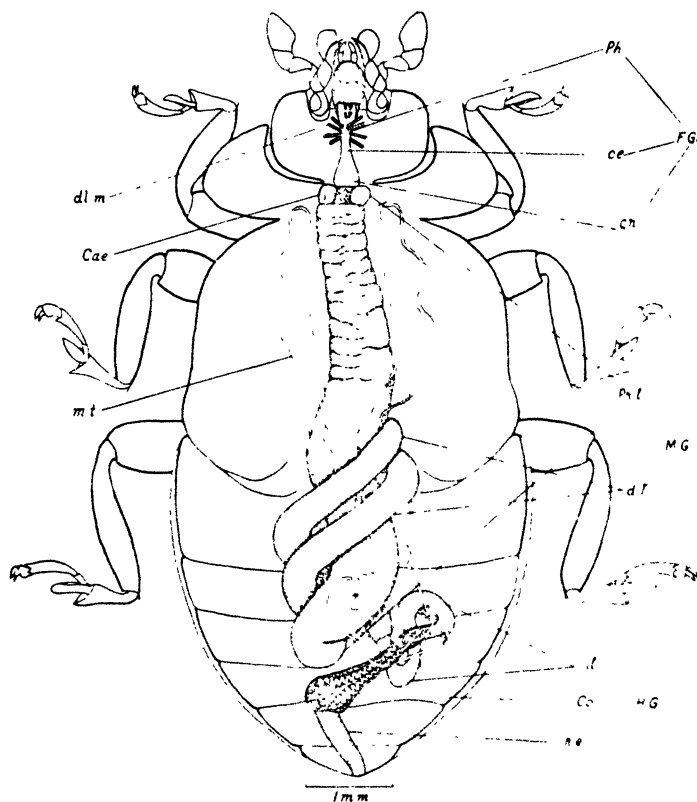


FIG. 1.—The alimentary canal of *E. indica* in situ: the coils have been slightly opened to render the coiling clear: *ca*, glandular diverticula; *co.*, colon; *cr.*, crop; *d.l.*, distal loop; *dlm.*, dilatator muscles; F.G., fore-gut; H.G., hind-gut; *il.*, ileum; M.G., mid-gut; *mt.*, malpighian tubules, *oe.*, oesophagus; *ph.*, pharynx; *pr.l.*, proximal lobe; *re.*, rectum.

generally and the mid-gut specially are capable of distention and contraction within a fairly wide range. The diameter of the alimentary canal at different levels depends largely on two factors: firstly, on the presence or absence of food in that region, and, secondly, on the phase of the peristaltic wave at which that part of the gut has been fixed. The peristalsis of the gut takes the form of a series of discontinuous waves which pass along the gut changing the diameter of any portion, specially that of the mid-gut. These peristaltic movements can be observed under

a binocular microscope when a freshly narcotized insect is dissected in normal saline solution.

*The fore-gut.*—The fore-gut is a comparatively short flask-shaped tube, almost wholly confined to the head-capsule. It consists of: (1) the *buccal cavity*, (2) the *pharynx*, (3) the *œsophagus*, (4) the *crop*, and (5) the *œsophageal valve*, the last being telescoped within the anterior end of the mid-gut. The mouth leads through the buccal cavity into the pharynx but there is hardly anything to distinguish the boundary of the buccal cavity from that of the pharynx, the one passing insensibly into the other.

The *pharynx* is a short tube which shows a slight enlargement and then narrows evenly behind to form what may be called the pharyngeal 'constriction'. A number of stout dilator muscles arranged in small groups (*dl.m.*) arise from the wall of the buccal cavity and the pharynx. These muscles run in different directions and are inserted in the different parts of the head-capsule and the tentorium. From their position and attachment, there seems little doubt that they serve to dilate the buccal and the pharyngeal cavities.

Behind the pharyngeal constriction lies the short narrow *œsophagus* which widens posteriorly to form the *crop* (*cr.*). At its posterior end the crop narrows down and becomes telescoped into the anterior end of the mid-gut, forming what is commonly known as the '*œsophageal valve*' (fig. 6).

*The mid-gut.*—The mid-gut forms the most prominent region of the alimentary canal and is variously coiled and twisted, lying along the median axis of the thorax and abdomen as shown in fig. 1. In a dissection it appears to consist of two distinct divisions: (1) an almost straight *proximal lobe* (*pr.l.*) and (2) a coiled *distal loop* (*dl.*). From the junction of the head with the thorax the proximal lobe runs behind almost in a straight line, lying just beneath the heart and extending up to the third visible sternite of the abdomen. The anterior end of the proximal lobe is produced dorso-laterally into a pair of inconspicuous but distinct pocket-like glandular diverticula,<sup>1</sup> each of which is divided externally by two or three longitudinal grooves. Behind these diverticula, the wall of the proximal lobe shows a large number of both transverse and oblique folds. The extent of these folds in this region shows a great variation in different specimens, depending apparently on the course of peristalsis. It may be noted, however, that the longitudinal muscles (*vide infra*) are not included within these folds, since in a dissection of a fixed specimen, they can be clearly seen stretching across the grooves between these folds.

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<sup>1</sup> These diverticula have not been described in *E. corrupta* either by Potts or by Burgess.

At its hind end, the proximal lobe becomes narrow and is sharply bent downwards and then outwards, emerging out on the left side of the proximal lobe and forming the *first limb* of the distal loop. This limb now coils round the proximal lobe, and on reaching a little to the left of the mid-ventral line, runs back as the *second limb* lying parallel and anterior to the first limb. It now crosses the first limb and the proximal lobe and reaches the level of the hind end of the latter. Here the mid-gut passes into the hind-gut, the junction of the two being marked by the origin of six malpighian tubules. The distal loop has a narrow calibre and does not show any regular folds like those present on the proximal lobe, though a few folds may be present in some parts of the distal loop as well.

*The hind-gut.*—The hind-gut is a much shorter tube than the mid-gut, though it is more than three times the length of the fore-gut. It consists of: (1) the *ileum*, (2) the *colon*, and (3) the *rectum*. Just behind the origin of the malpighian tubules the *ileum* forms two short loops, and then gradually widens out to form the pear-shaped *colon* (*co.*). Both the colon and the hinder part of the ileum have malpighian tubules adhering to their walls. Posteriorly the colon ends rather abruptly and is clearly demarcated from the highly muscular rectum (*re.*). The rectum is a short tube and looks like an elongated sphincter on account of its thick musculature.

When the coils of the alimentary canal are undisturbed, the two limbs of the distal loop, the distal portion of the proximal lobe and the distal part of the ileum together with the colon form four parallel coils as shown in fig. 1. All these structures look quite plump and fresh even in a fixed specimen.

### 3. HISTOLOGY OF THE ALIMENTARY CANAL.

Essentially the structure of the alimentary canal of *E. indica* is not at all different from that of any other typical insect. It consists as usual of a single layer of internal epithelial cells surrounded first by an inconstantly distinguishable basement membrane and then by the layers of circular and longitudinal muscles. The wall of the gut is also lined internally with a variable intima which is chitinous in the fore- and the hind-guts. Externally the gut is surrounded by an inconstantly noticeable fascia.

The histology of the alimentary canal presents difficulties which seem insurmountable on a first examination of the serial sections. These difficulties are due to the fact that the histological characters of the different regions of the alimentary canal change so rapidly that not only do the cells appear different after every few sections in the series, but that even in the same transverse section, one often finds a large variety not only of the form and size of the cells, but even in the consistency and the

staining capacities of their contents. As a matter of fact, the variations exhibited by the cells of the alimentary canal are so many and so sudden that it is very difficult to co-relate them without constantly taking into consideration the probable physiological phase of these cells.

*The fore-gut.*—Unlike the condition in *E. corrupta* (Potts, 1927 and Burgess, 1932), the histological character of the fore-gut (figs. 2, 3, 4, 5) in *E. indica* varies considerably in its different regions. The variations relate, firstly, to the foldings of the chitinous intima and secondly, to the relative disposition of the musculature, the character of the epithelium remaining almost constant throughout the length of the fore-gut. The epithelium consists of small cubical cells arranged in a squamous manner within the chitinous intima. The cytoplasm of the cells is very finely granular and the nuclei very well-defined, each nucleus containing generally a single deeply staining granule, the nucleolus. The cell outlines are often indistinct and the basement membrane is hardly distinguishable.

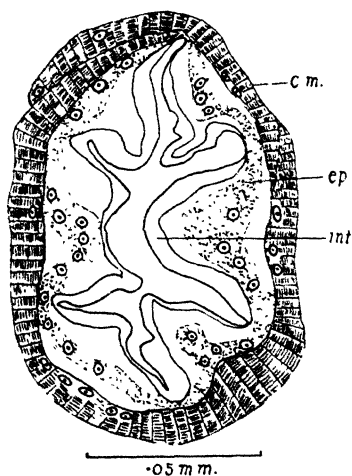


FIG. 2.—T.S. through the pharynx: *c.m.*, circular muscles; *ep.*, epithelium; *int.*, intima.

In sections through the pharynx (fig. 2), the chitinous intima is seen to be strongly developed and may be as much as 8 microns in thickness. It forms a compact layer which stains deep green with indigo-carminé; with eosin it either retains its natural brown colour or only takes up the red tinge of eosin. It is thrown into six longitudinal folds which generally carry the epithelium with them. The outlines of these folds in transverse sections are irregular and inconstant, showing that the height of each fold varies along its length. The musculature consists

almost entirely of moderately developed circular muscles, as hardly any longitudinal strands are visible. Besides, there are radially directed dilator muscles which appear to originate directly from the intima (fig. 3).

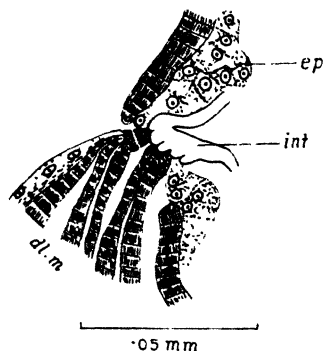


FIG. 3.—A portion of T.S. through the pharynx showing the origin of the dilator muscles; *dl.m.*, dilator muscles; *ep*, epithelium; *int.*, intima.

In the region of the œsophagus (fig. 4), however, the chitin becomes weaker and less compact, as is shown by the fact that it stains faintly with eosin and indigo-carmin. The intima in this region is extremely thin being only about 2.0 microns thick. The six folds of the wall of the pharynx flatten out and give place to an uneven surface. The circular muscles, like those of the pharynx, are moderately well-developed but in addition, the longitudinal muscles also begin to appear, although they

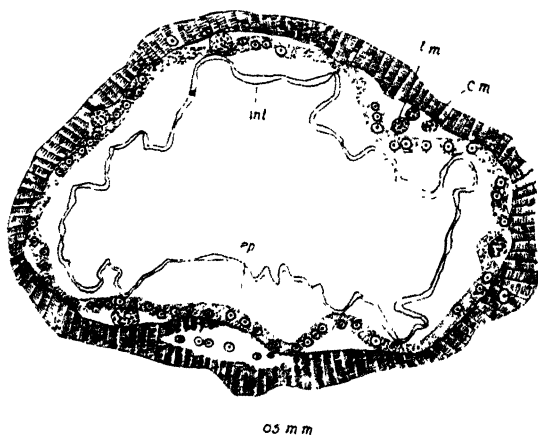


FIG. 4.—T.S. through the œsophagus: *c.m.*, circular muscles; *ep*, epithelium; *int.*, intima; *l.m.*, longitudinal muscles.

consist of only a few very narrow strands lying scattered in the different parts of the œsophagus.

The histology of the pharynx and the œsophagus of *E. corrupta* as described by Potts (1927) seems to be very different from that in *E. indica*. According to him the 'epithelium' of the pharynx in *E. corrupta* 'is not thrown into folds' while the 'intima' and also the epithelium (as shown in his diagram) 'of the œsophagus seem to be thrown into a series of longitudinal folds usually four in number'. Burgess (1932) while describing the same species neither contradicts Potts nor does he make any mention of the longitudinal folds in the œsophagus. In *E. indica* on the other hand, it is the pharyngeal wall that is thrown into six longitudinal folds, there being no longitudinal folds in the œsophageal wall in front of the crop. Potts has also described the presence of teeth on the œsophageal wall but Burgess entirely contradicts this statement. In *E. indica* also, I have not found any teeth at all.

In the region of the crop (fig. 5) the arrangement of the several components of the gut-wall becomes entirely different. The chitinous intima is compact and stains deeply as in the case of the pharynx; and there are four well-defined major longitudinal folds alternating with four minor ones. From each of the major folds arise a number of long narrow bristles which are

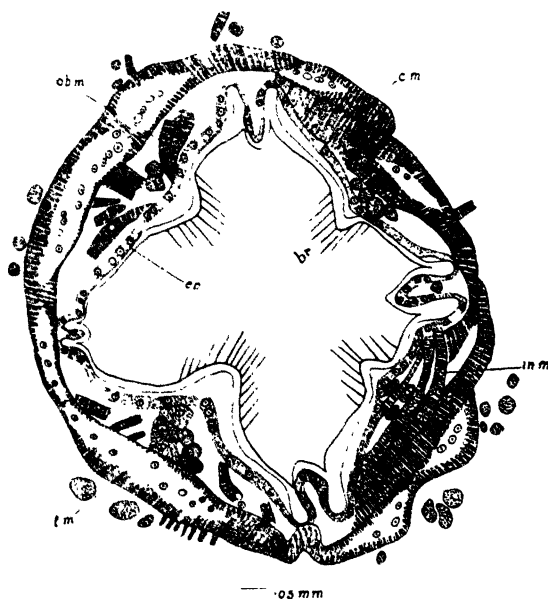


FIG. 5.--T.S. through the crop: *c.m.*, circular muscles; *ep.*, epithelium; *in.m.*, intrinsic muscles; *int.*, intima; *l.m.*, longitudinal muscles; *ob.m.*, oblique muscles; *br.*, bristles.

apparently outgrowths of the chitinous intima. As is clear from fig. 5, the whole wall of the œsophagus is divided by the major folds into four distinct quadrants.

The musculature of the crop is very elaborate and interesting and we can distinguish the following sets of muscles :

1. *Circular muscles*.—These muscles (*c.m.*) are quite thick and surround the gut either completely or partially. The complete muscles are like ordinary circular muscles which surround the crop in a typical insect without showing any connection with the epithelium. The partially surrounding muscles lie among the ordinary circular ones, but have one or both of their ends attached to the epithelium of a fold. This latter type of muscles has not been described in *E. corrupta* by either of the two workers referred to above, and even in other species has been described only in a few cases. Anyhow, the statement generally made that the circular muscles simply encircle the gut without being attached anywhere does not seem to be universally true.

2. *Longitudinal muscles*.—These muscles (*l.m.*) are not so stout as the circular ones. They originate from the epithelium at the posterior free end of the œsophageal valve (*vide infra*) and always lie inside the circular muscles. They run forwards as a few narrow strands in the wall of the œsophagus (already described).

3. *Oblique muscles continuous with those of the mid-gut*.—These muscles (*ob.m.*, figs. 5 and 6) are also fairly stout. Originating at different levels from the epithelium of the major folds of the crop, they run obliquely outwards and backwards and pierce the rest of the musculature and then converge into small groups which run externally to the circular muscles for a short distance, bridge over the œsophageal valve and become continuous with the external longitudinal muscles of the mid-gut. In serial transverse sections, these muscles are cut in different directions. At places they are cut longitudinally and appear to radiate from the epithelium of the major folds : at other places they are cut transversely and lie outside the circular muscles of the crop. From their mode of attachment it appears that these muscles may be acting as dilators for the major folds, but from the fact that these muscles run outwards and *backwards* it seems more probable, however, that they act as erectors for the bristles which ordinarily remain directed backwards. It may also be noted that these muscles are not the continuations of the longitudinal muscles of the fore-gut. Thus the longitudinal muscles of the fore- and the mid-guts are not continuous as has been generally described in the gut of other insects.

4. *Intrinsic muscles of the folds*.—Besides the circular muscles already described, there are also well-developed circular intrinsic muscles (*in.m.*) in each of the four quadrants of the wall of the crop. These muscles stretch across the two adjacent walls of each fold. The position and attachment of these

intrinsic muscles are evidently related to the formation of these folds. When these muscles contract, the folds project deeply into the lumen of the crop while on their relaxation the folds flatten out.

The musculature of the crop, like that of the whole of the fore-gut, shows an abnormally large number of nuclei (figs. 4 and 5) which are at times arranged in long rows in a manner more or less similar to what has been sketched by Pavlovsky and Zarin (1922) in the case of the stomach of the honey-bee.

After understanding the elaborate structure of the crop, its functions also become sufficiently intelligible. The presence of the strongly developed folds of the intima often reaching quite deep into the lumen of the crop, the long fine bristles which are probably moved by the oblique muscles, and, lastly, the elaborate musculature of the crop as a whole rendering all kinds of movements possible for the wall of the crop—all these lead to the conclusion that the crop is a good churning apparatus for the food. It may also be added that some of my sections show the presence of the mid-gut secretions in the crop, thus indicating that the food and the secretions are mixed up in this part of the gut. Besides the mixing and the churning of food and secretions, it is also possible that when the major folds project into the lumen and their bristles are erected, the bristles may form a good straining sieve.

Such an elaborate structure of the crop has not been described in *E. corrupta*. Potts does not describe any structure and simply writes, 'The crop is not so well developed in *E. corrupta*'. Burgess on the other hand, describes the crop and sketches a section through the same. His sketch and description are surprisingly different from those of mine and the differences become all the more remarkable when we take into consideration the fact that the two are the species of the same genus and possess almost similar habits. In *E. corrupta* there are no definite folds of the intima as in *E. indica*. The spines in *E. indica* are confined to the top of the major folds, while in *E. corrupta* they cover the entire lining of the crop. The musculature of the crop in *E. corrupta* is quite typical while it is much more complex in *E. indica*. The abnormally large number of nuclei in the muscles described above in *E. indica* has neither been described nor sketched in *E. corrupta*. Further in *E. corrupta* Burgess writes that the spines 'are probably to grind up the food', but in *E. indica* the spines are too fine and elongate for grinding purposes: here they may be acting as a strainer, or helping in the admixture of food and secretions or they may be performing both the functions.

*The œsophageal valve.*—The so-called œsophageal valve (fig. 6) is a more or less funnel-shaped structure formed by the telescoping of the fore-gut into the mid-gut. It is therefore double-walled, the inner wall being formed of flat fore-gut epithelium lined internally with a chitinous intima which is thrown into four



longitudinal folds as in the crop. The outer wall on the other hand, is formed of very narrow elongate cells with no lining of

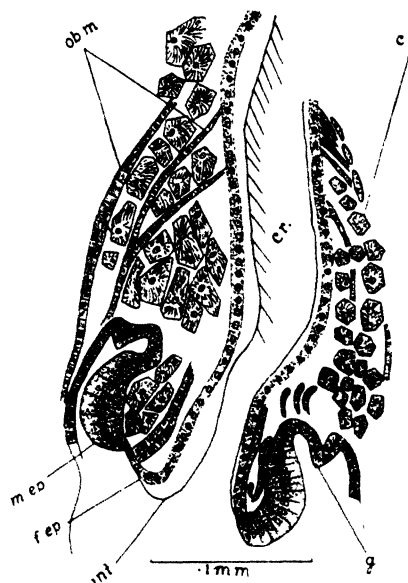


FIG. 6.—L.S. (vertical) through the oesophageal valve: *c.m.*, circular muscles; *cr.*, crop; *f.ep.*, fore-gut epithelium; *int.*, intima; *l.m.*, longitudinal muscles; *m.ep.*, mid-gut epithelium; *ob.m.*, oblique muscles.

the chitinous intima. As a matter of fact, the chitinous intima of the inner wall gradually becomes thinner and thinner till it disappears at the posterior free end of the valve. The change in the shape of the epithelial cells as well as the absence of the chitinous intima indicate that the point of division between the fore-gut and the mid-gut lies at the posterior free end of the oesophageal valve.

The space between the inner and outer epithelia of the valve is filled with longitudinal and circular muscles, the former lying internally to the latter. The circular muscles both within and in front of the valve are much better developed than the longitudinal. In fact, the circular muscles form a regular sphincter in front of the valve, the sphincter being up to 50 microns in thickness.

Mention may also be made here of the slightly raised girdle (*g.*, fig. 6) of the mid-gut epithelium situated just round the base of the oesophageal valve. Wigglesworth (1930) has described similar girdles in several insects including *Coccinella septempunctata*. It is, however, noteworthy that no such

structure has been described in *E. corrupta*. Wigglesworth has shown beyond doubt that these girdles secrete the peritrophic membrane in the insects he has studied, and there is every probability that in *E. indica* as well this girdle performs the same function, although I have not seen a direct connection between the peritrophic membrane and this girdle with much certainty.

*The mid-gut.*—Histologically the mid-gut (figs. 7 to 13) is distinguished from the fore-gut, firstly, by the absence of the chitinous intima and secondly, by a reversal in position of the two kinds of muscle, the circular ones lying within the longitudinal and not *vice-versa* as in the case of the fore-gut. The two divisions of the mid-gut, i.e. the 'proximal lobe' and the 'distal loop', differ markedly in histological characters and are therefore treated separately.

*The proximal lobe.*—The anterior part of the proximal lobe extending up to one-third or even one-half of its length appears to be the seat of most vigorous physiological activity. In this portion, the epithelial lining together with its basement membrane and the circular muscles, is almost always found to be thrown into irregular folds, in the formation of which the longitudinal muscles take no part.

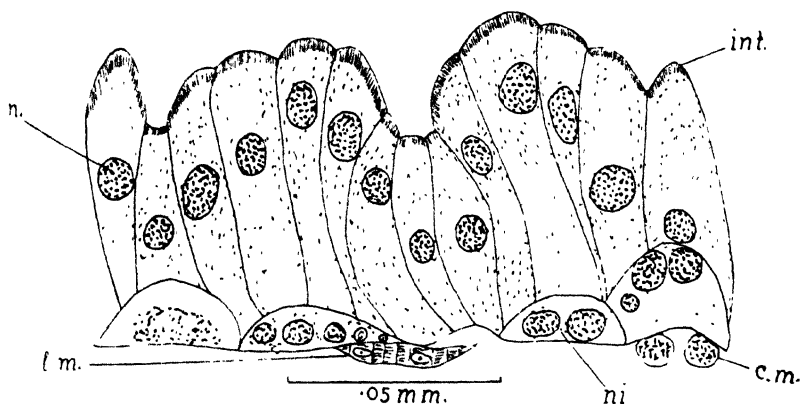


FIG. 7.—Portion of epithelium (L.S.) from the anterior region of the proximal lobe: c.m., circular muscles; int., intima; l.m., longitudinal muscles; n., nuclei; ni, nidi.

The epithelium in this region consists mainly of large columnar cells (figs. 7 and 8) with patches of very small cubical cells in between. In the resting stage, the columnar cells are fairly regular in shape but during their physiological activity present a large variety of forms. The cytoplasm is usually granular but its consistency changes largely with its activity. In the resting stage, the inner border of the cells shows a definite and often more deeply staining striated intima, but in the

secreting cells the free margin is often jagged and irregular. The nuclei show a fairly wide range of variation both in their size and in their position within the cell; at some places they lie in a definite wavy line (fig. 7) forming alternate crests and troughs while at other places (figs. 13 and 14) no definite arrangement can be made out. The number of the nuclei within a single cell also varies from zero to several, specially in the actively secreting cells. The outlines of these nuclei are often definite and clear; they are rounded, oval, or even elongate in shape. Internally they are made up of a rather loose network of fine fibrils studded with chromatin granules of various sizes.

At the bases of these columnar cells lie little dome-like structures called the nidi. (*ni.*). These are small multinucleate masses of cytoplasm, over which the columnar epithelium forms a series of arches: at some places the nidi appear to be mere groups of nuclei containing very little or no cytoplasm at all, while at other places they may be represented only by masses of cytoplasm with some chromatin granules scattered therein. From an examination of a large number of nidi, it appears that the amount of cytoplasm bears an inverse ratio to the size and number of the nuclei in the nidus. The nature of these nuclei seems to be the same as that of the nuclei of the columnar cells and their number in each nidus varies from zero to several. The distribution of the nidi is quite irregular: at some places they are so numerous that they lie contiguous to one another, while at other places, they are very sparse. The size and shape of the nidi are also subject to considerable variation: at some places the nidus presents the appearance of a small inverted saucer (fig. 7), while at other places it forms a high dome-like structure (fig. 14*a*).

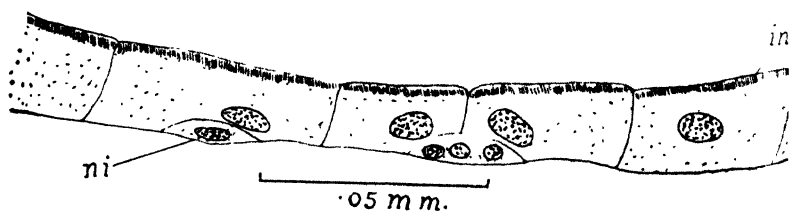


FIG. 8.—Portion of epithelium (T.S.) from the posterior region of the proximal lobe: lettering as in Fig. 7.

In the posterior portion of the proximal lobe (fig. 8) the nature of the epithelium is completely changed. The tall columnar cells of the anterior portion here give place to short flat cells lengthened in the tangential direction; the nidi are very small and scarce and the musculature is distinctly ill-developed.

From the histological characters of the epithelium of the two regions of the proximal lobe, it appears that while copious secretions are poured on the food in the anterior region, the posterior region forms a chamber where these secretions have time to act on the food. The lumen of the anterior region is generally filled with secretions and portions of secretory cells; the lumen of the posterior portion, on the other hand, generally contains a food-cylinder enclosed within a very thin peritrophic membrane. The space round the food-cylinder contains disintegrated cell-products or sometimes even non-disintegrated portions of the epithelium. Even within the food-cylinder one sometimes finds nucleated masses of cytoplasm.

*The distal loop.*—The most easily noticeable peculiarity of this region (figs. 9, 10, 11, 12) is the irregularity in the height of the epithelial cells. In certain areas, most of the epithelial cells are considerably tall while in others the cells are short and cubical. The transition from tall to short cells is gradual at some places and abrupt at others. The distribution of the nidi is also not uniform. In the region of the elongate cells, the nidi are fairly large and numerous but they are much smaller and often very sparse in the region of the short cubical cells.

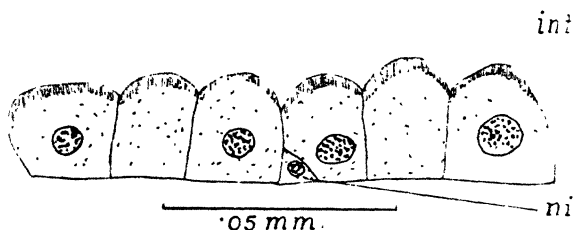


FIG. 9.—Portion of epithelium (L.S., young and undifferentiated) from the mid-gut: lettering as in Fig. 7.

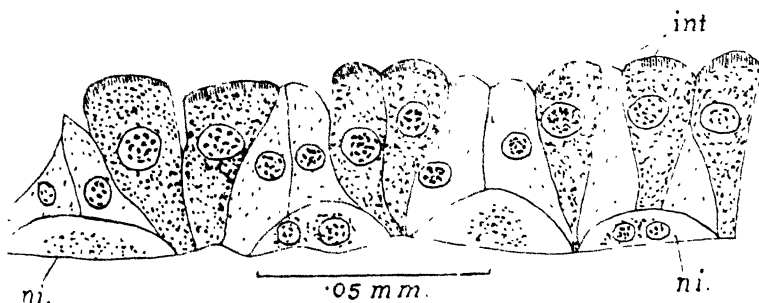


FIG. 10.—Portion of epithelium (L.S.) from the distal loop of the mid-gut (slightly older than that shown in Fig. 9): lettering as in Fig. 7.

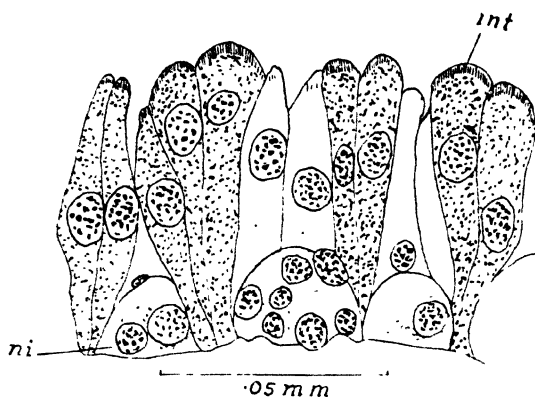


FIG. 11.—Portion of epithelium from the distal loop of the mid-gut : here the differentiation has gone further : lettering as in Fig. 7.

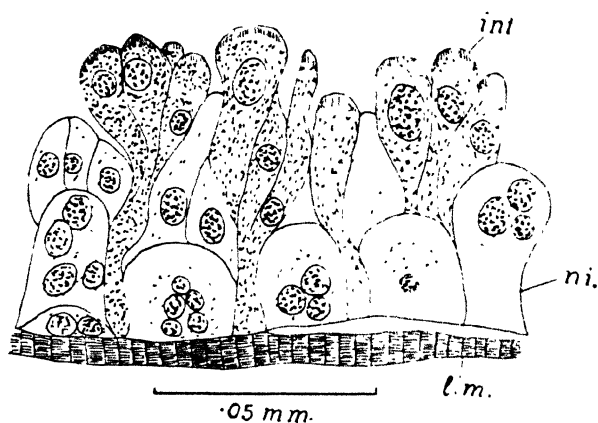


FIG. 12.—Portion of epithelium from the distal loop of the mid-gut : here the differentiation has gone still further : lettering as in Fig. 7.

Another peculiarity of the distal loop epithelium is that the tall cells are differentiated apparently into two distinct kinds, one kind of cells staining much more deeply than the other. The deeply staining cells vary in shape ; some are goblet-shaped (fig. 10), others club-shaped (fig. 11), and still others are so much drawn out as to rest on elongated peduncles (fig. 12). The lightly staining cells, on the other hand, are generally broader at their base, although they vary considerably in their height. The differences in the shape and grouping of the deeply staining cells give different appearances to the epithelium of the various

regions as seen in sections. When the pedunculate cells are situated in small groups on the top of the nidi, they look like regularly arranged flower-bouquets (fig. 12), and give a pretty appearance to the whole epithelium of the region.

The epithelium shows these characters very nearly up to the posterior end of the mid-gut. At the extreme posterior end, however, the epithelial cells become particularly tall and narrow, and often reach almost the centre of the lumen, specially so, near the origin of the malpighian tubules where they become so compact in addition that in sections the epithelium often appears to consist of several layers of cells (fig. 13).

We may note that the differentiation of the tall elongate cells into two kinds as described above, has not been noticed either by Potts or by Burgess in *E. corrupta*.

*The pyloric valve.*—The pyloric valve (figs. 13; and 13a Pl. 4) lying at the junction of the mid-gut and the hind-gut, results

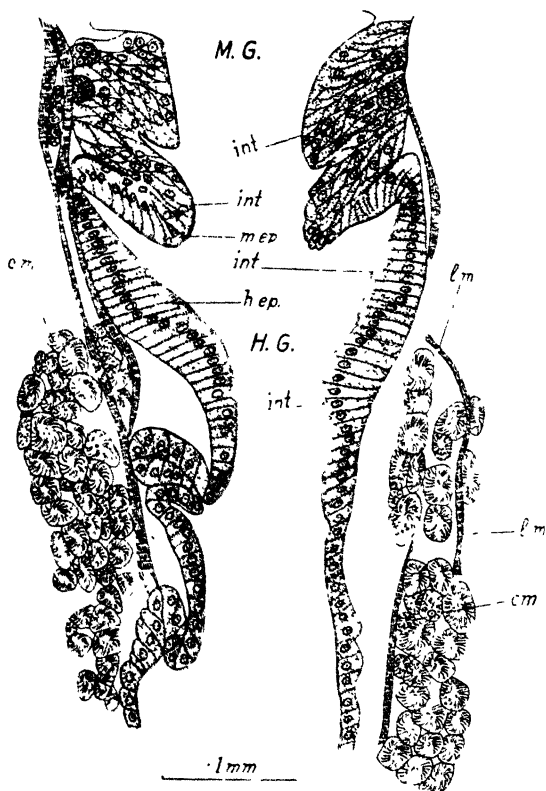


FIG. 13.—L.S. through the pyloric valve: *c.m.*, circular muscles; *H.G.*, hind-gut; *int.*, intima; *l.m.*, longitudinal muscles; *M.G.*, mid-gut; *m.ep.*, mid-gut epithelium; *h.ep.*, hind-gut epithelium.

by a slight telescoping of the mid-gut into the hind-gut and thus leads to the formation of a space round the distal extremity of the mid-gut. Both the inner and outer walls of the valve consist of elongated, compactly placed and rather deeply staining epithelial cells like those of the mid-gut, but at the place where the outer wall of the pyloric valve passes into the wall of the hind-gut, the nature of the epithelium changes considerably; here the epithelium consists of closely fitting narrow columnar cells lined with a very thin intima which is probably chitinous. The musculature of the gut just round the valve is remarkably ill-developed, there being no circular muscles in this region.

Another peculiarity to be noticed in this region is, that opposite the point of entrance of each malpighian tubule, there is a definite pad<sup>1</sup> on the inner wall of the pyloric valve. These pads as seen in the microphotograph (fig. 25, Pl. 4) are oval in transverse section and more or less reticulate in structure.

About 110 microns behind the pyloric valve, the circular muscles are very strongly developed (fig. 21, Pl. 4) and, in fact, form a thick sphincter up to 80 microns in thickness. The epithelial cells are essentially similar to those at the junction of the pyloric valve and the hind-gut. Sometimes, however, the epithelium looks, in serial sections, like a syncytium rather than a cellular epithelium. All these changes which have been described in this 'transition zone' take place within a short length of about .35 mm.

The accounts of this transition zone, specially those of the pyloric valve, given by the two workers on the same species, i.e. *E. corrupta* are surprisingly contradictory; Potts (1927) writes, 'No typical pyloric valve occurs in the gut of *E. corrupta*'. Burgess (1932), on the other hand, without expressly contradicting Potts, writes, 'The pyloric valve is very well-developed. Grossly it is a long structure placed in the tract in a manner similar to that of the "sections" in an orange. There are six of these sections and when viewed in cross-section they appear as six lobes extending into the lumen of the hind-intestine. These ridges occur in one form or another all along the proctodaeum. . . The most prominent layer in the pyloric region is the layer of the circular muscles that is found outside the basement membrane. This layer of muscles is probably the most outstanding muscle layer in the whole of the alimentary canal.' From this description of the pyloric valve given by Burgess, there seems little doubt that Burgess has mistaken the sphincter lying behind the region of the actual valve for the valve itself.

*The hind-gut.*—Structurally, the hind-gut differs from the mid-gut, firstly, in the re-appearance of the chitinous intima which characterizes the fore-gut, secondly, in the non-glandular but compact nature of its epithelial lining, thirdly, in the absence

<sup>1</sup> I have not seen such pads described elsewhere.

of the nidi, and fourthly, in the special development of the muscles in certain regions. These differences are described in detail below.

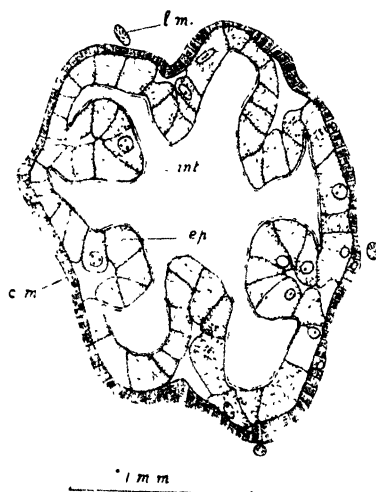


FIG. 14 T.S. through the ileum (anterior portion): *c.m.*, circular muscles; *ep.*, epithelium; *int.*, intima; *l.m.*, longitudinal muscles.

*The ileum.*—Posterior to the sphincter which extends about 215 microns in length, the nature of the epithelium changes again. The cells assume the typical character of the hind-gut epithelium, which is thrown into six typical longitudinal folds (fig. 14), though sometimes a few additional invaginations are also observed. The cytoplasm of the cells is finely granular, unlike that of the cells of the mid-gut, where it is coarsely granular.

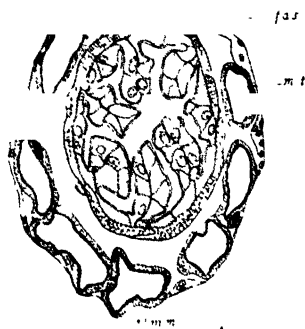


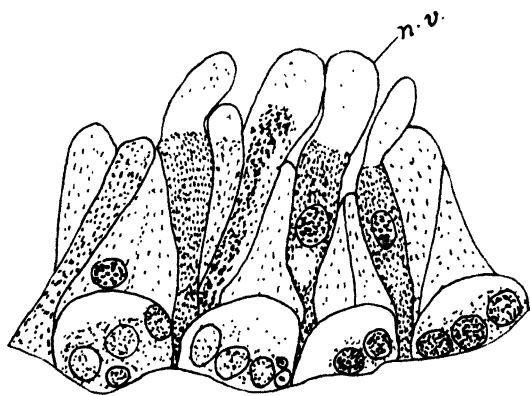
FIG. 15.—T.S. through the ileum (posterior portion): *fas.*, fascia; *m.t.*, malpighian tabules; rest as in Fig. 14.



During this period of nearly half a century, only Newcomer (1914) and Pavlovsky and Zarin (1922) seem to have deviated from the general conclusions enunciated by Van Gehuchten. Newcomer only suspected but Pavlovsky and Zarin definitely concluded that the so-called secretory globules are mere artefacts. H. Henson (1930), however, for the first time seriously contended that the 'so-called merocrine method of secretion of the gut cells may not be a secretion process at all'. He favours the alternative view that the formation of secretory vesicles is really a process of cell disintegration due to wear and tear or to the incidence of metamorphosis. Recent tendency is to favour Henson's contention. I do not propose to enter into the controversy as to whether the activities of the mid-gut epithelium are secretory or are of the nature of disintegration processes but I am confining myself to the relation between the different processes and also their effect on the visible structure of the epithelial cells.

Potts (1927) does not describe any particular mode of secretion in *E. corrupta*; Burgess (1932) working on the same species describes the secretion as being of 'a modified holocrine type'. He says that 'the ends of the secreting cells' are constricted and pinched off as 'balls of digestive fluid'. 'In no case was the nucleus of the secreting cell found in the globule that was secreted.' In *E. indica* on the other hand, the contents of the epithelium enter the lumen in the following ways:—

- (1) as non-nucleated vesicles,
- (2) as individual cells squeezed out in their entirety into the lumen;
- (3) as delaminations of the portions of the gut epithelium;
- (4) as streams of nuclei from the nidi.



· 5 m m .

FIG. 18a.—Portion of epithelium (T.S.) from the distal loop of the mid-gut showing the non-nucleated vesicles (n.v.).

(1) *Non-nucleated vesicles*.—This process (figs. 18a ; and 18b, Pl. 4) has been observed by me only in the distal loop of the mid-gut. Clear vesicles full of some fluid bulge out from the top of the deeply staining club-shaped cells and either simply burst to let out the contents or are pinched off as small globules. This process is the 'merocrine' type of secretion of Haseman (1910)—a process which has been described by many workers on the alimentary canal ever since Van Gehuchten described it in *Ptychoptera contaminata* in 1890.

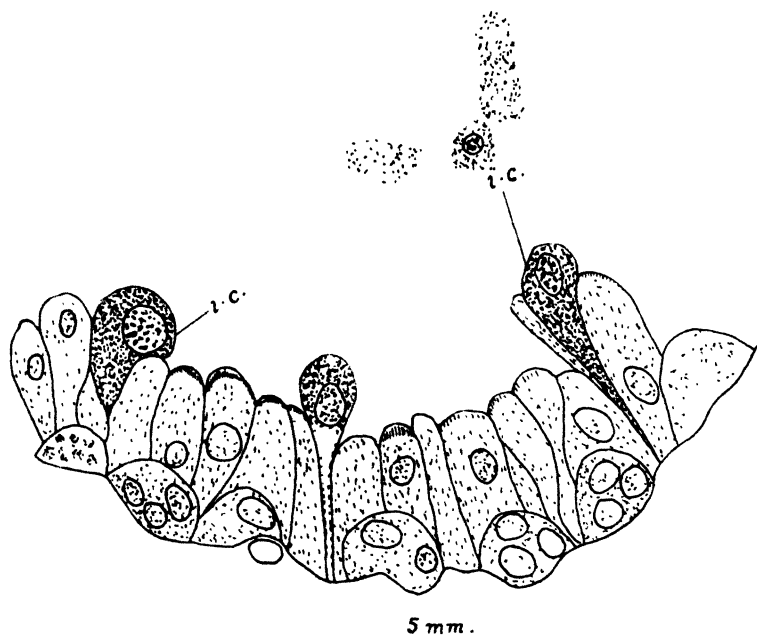


FIG. 19a.—Portion of epithelium (T.S.) from the distal loop of the mid-gut showing the 'squeezing out' of individual cells (*i.c.*).

(2) *Squeezing out of individual cells*.—In this process, the individual cells are simply squeezed out into the lumen. Here the cells gradually break up and get mixed up with the gut contents. This is the 'holocrine' type of secretion of Haseman and has also been described in several insects, as for example in the dragon-fly nymphs by Needham (1897) and in *Tabanus* by Cragg (1920). I have observed this process in all its stages in the distal loop of the mid-gut (figs. 19a : and 19b, Pl. 4).

(3) *Delaminations of portions of the epithelium*.—During this process, large portions of the epithelium are simply sloughed off into the lumen, leaving behind a few nidal nuclei, which afterwards regenerate the sloughed off epithelium. The delamination of the mid-gut epithelium at the time of moulting has been

described by various investigators and it appears that it is a common occurrence amongst insect larvæ, but in the adult insect, this phenomenon has been described only in a few water-beetles. Haseman (1910) says that Frenzel ('85), Vangel ('86), Bizzozzero ('93) and Rengel ('97) have described epithelial degeneration and regeneration in adult water-beetles of the genera *Hydrophilus*, *Hydrobius*, *Hydrous* and *Cybister* respectively. 'In these beetles the entire epithelium with its basal chitinous membrane is described as being cast off after each full feeding. The new epithelium is quickly developed from highly specialized regenerating centres or nidi.' Wigglesworth (1929) writes in the case of the tse-tse fly, 'At times there is a considerable break down of the epithelium and this is regenerated subsequently'. Burgess (1932) describes a 'curious splitting of the epithelium' in the anterior region of the mid-gut of the hibernating *E. corrupta* and contends that it cannot be an excretory function as in the moulting *Collembola* described by Folsom and Welles (1906). Burgess regards it possibly as 'a mechanism to keep the animal nourished during its hibernating

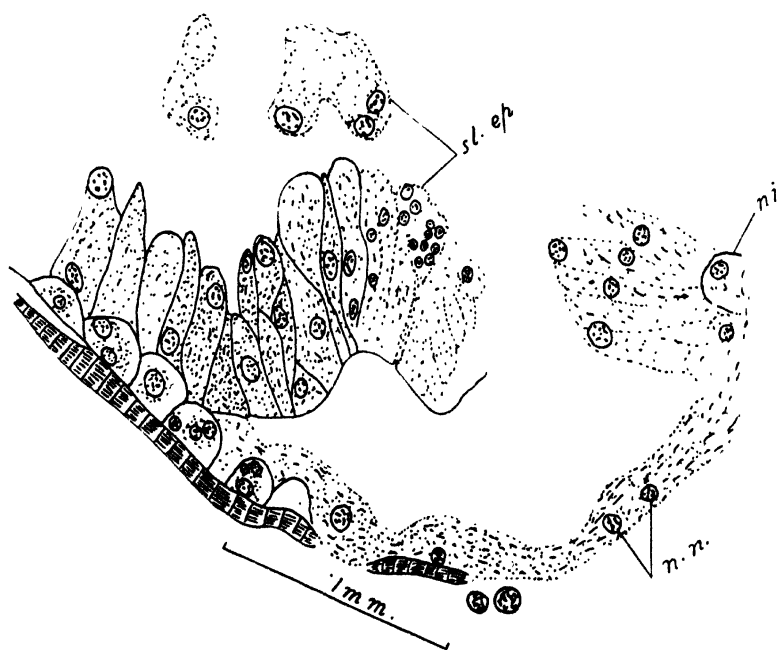


FIG. 20a.—T.S. through the anterior portion of the proximal lobe, showing the 'sloughed off epithelium (sl.ep.)'; n.n., nidal nuclei.

period'. In *E. indica* on the other hand, this process (fig. 20a). (figs. 20b and 20c, Pl. 4) is a common occurrence in the adult

feeding stage, and cannot be interpreted as in *E. corrupta* to be a nourishing 'mechanism' in the absence of normal food.

(4) *Streams of nidal nuclei*.—In this process (figs. 21 and 22a; 22b, Pl. 4) the nuclei from a nidus enter the epithelial cells next

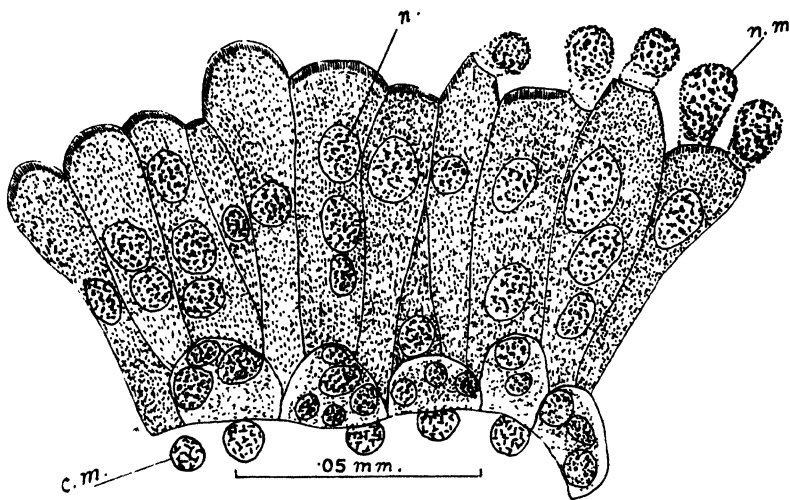


FIG. 21. Portion of epithelium (L.S.) from the anterior part of the proximal lobe showing the extrusion of the nuclear material: *n.m.*, nuclear material; rest of the lettering as in Fig. 7.

to it and migrate towards the lumen through the length of the epithelial cells; on reaching the inner ends of the cells, the nuclei are either pinched off into the lumen as nucleated masses of cytoplasm or are poured out as nuclear material into the lumen through a definite, circular and comparatively large aperture on the inner border of each epithelial cell. As clearly seen in the microphotograph (fig. 22b, Pl. 4) the nuclei can be followed in all the stages in their migration from the nidus to the lumen of the gut. This process is met with in the anterior portion of the proximal lobe. A process of this kind, so far as known to me has not been described in any other insect.

Thus almost all the processes, by which the contents of the epithelium are discharged into the lumen in different insects, can be observed in the same series of sections in *E. indica*. Due to this co-existence of the different processes, it becomes easy to observe the gradation and also to interpret the relations between them. A careful study of these processes renders it clear that all of them are really different phases of the same process. In the newly formed epithelium all the cells are more or less alike (fig. 9) and the nidi between them are either small and flat or are represented even by single interstitial cells (*ni.*). A little later the nidi grow to a bigger size and become more

convex in shape, while the epithelial cells get differentiated into deeply staining club-shaped cells and the lightly staining cells

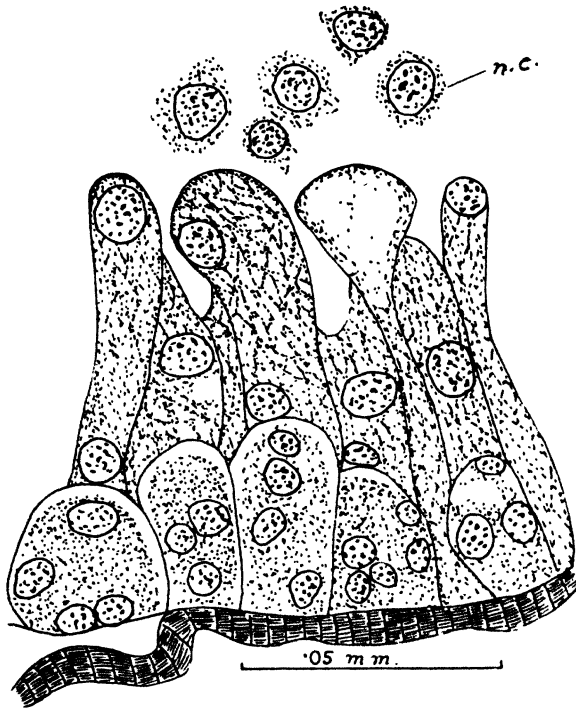


FIG. 22a.-- Portion of epithelium from the anterior region of the proximal lobe (T.S.) showing 'nuclear migration' and throwing off of the nucleated masses of cytoplasm (*n.c.*).

with broader bases. This differentiation of the epithelial cells is probably brought about by an increase of pressure at the bases of the older cells caused by an addition of new cells from the nidi. The greater affinity for stains exhibited by the club-shaped cells seems to be due to a larger accumulation within these cells of secretory or excretory products. Thus it would appear that the deeply staining club-shaped cells in *E. indica* differ from the faintly staining cells only in age. This leads us to the conclusion that the two kinds of the cells distinguished by Van Gehuchten as secretory and absorptive are the same cells at different stages of development.

An examination of the gradations from the simple club-shaped cells to those capped with non-nucleated vesicles leads us to believe that the formation of these vesicles is a result of a further increase of pressure on the sides of the club-shaped cells caused by the same activities of the nidi as are responsible for

the club-shaped appearance of these cells. It appears equally probable that the second process referred to above, i.e. the squeezing out of the individual cells in their entirety is also a consequence of the continued increase in pressure on the cells even after the formation of vesicles. Thus the first two processes are simply the two phases of the same process. It is but natural to conclude that a gradual increase of pressure will squeeze out first the more fluid content of the cell and then the cell itself. It is, however, also possible that sometimes due to a sudden and quick increase in pressure, the first phase may be completely eliminated and the cells may directly enter the second phase.

The gradation from the second to the third process, i.e. from the squeezing out of individual cells to a delamination of epithelial portions is easily seen in the anterior region of the mid-gut. One can often observe that instead of the individual cells being squeezed out, large groups of cells are vigorously cut off into the lumen. It is easy to imagine that this process is merely a more vigorous and violent stage of the second process described above: and from this process, one is easily led to a stage where both the first and the second processes are completely eliminated and large portions of epithelium are simply sloughed off into the lumen. The fourth process, i.e. the migration of the nidal nuclei, is also a modification of the normal process of regeneration. The nidi instead of supplying well-defined cells, are supplying the nuclei only, the formation of separate masses of cytoplasm and cell-separations being masked due to the extraordinarily vigorous activity of the nidi. All the same this process of sending streams of nuclei into the lumen throws some light over the disputed function of the nidi. Ordinarily the nidi have a regenerative rôle, but the streaming of their nuclei into the lumen of the mid-gut suggests a glandular function also. It may be pointed out in this connection that the nidi have already been suspected to be glandular in several cases and have therefore been named '*drusen crypton*' by several workers.

### 5. PERITROPHIC MEMBRANE.

The study of the sections through the mid-gut of *E. indica* also throws some light on the efficiency of the peritrophic membrane. The peritrophic membrane was not found by me in all the transverse sections of the mid-gut. The epithelial cells discharged from the mid-gut epithelium are sometimes found mixed with the food material. Some longitudinal sections show shreds of peritrophic membrane which reveal a fenestrated structure (fig. 23, Pl. 4). These observations point to the conclusion that the peritrophic membrane while present in the major part of the mid-gut does not form a complete partition between the products of the epithelium and the food material.

## 6. FUNCTIONS OF THE ŒSOPHAGEAL AND PYLORIC VALVES.

From the structure and position of the œsophageal and pyloric valves, one is led to conclude that the closure at these junctions is not effected by the valves themselves but by the sphincters, one lying in front of the œsophageal valve and the other behind the pyloric valve. These so-called valves<sup>1</sup> are not valves in the strict sense of the term, preventing the contents of the mid-gut from passing into the fore-gut and those of the hind-gut into the mid-gut. The following considerations seem to justify the above-mentioned conclusions :—

If the œsophageal valve did really have a valvular action, the closure of the valve would be effected by a pressure of the contents of the gut round the valve between it and the wall of the mid-gut.<sup>2</sup> Such a pressure cannot be produced because, in the first place, the œsophageal valve is a well-developed double-walled structure strengthened by chitinous intima, while the wall of the mid-gut round the œsophageal valve is generally much weaker than the valve itself; if, therefore, the food exerts a pressure between the valve and the wall of the mid-gut, it is the latter that will bulge out rather than that the valve will be closed. Secondly, as the gastric cæca generally open in the annulus round the œsophageal valve, no pressure will be exerted in this region, unless the gastric cæca are also filled with the gut-contents and even then the gastric cæca will burst before the valve is pressed. Thirdly, if the closure between the fore- and the mid-guts were valvular, the secretion would be as much prevented from entering the fore-gut as the food-contents of the mid-gut from regurgitation; but it has been already observed by previous workers and I have confirmed their observations that the secretory globules of the mid-gut actually do pass into the fore-gut.

These considerations against the valvular action of the œsophageal valve are equally true in the case of the pyloric valve also. In place of the gastric cæca opening round the œsophageal valve, we have here the malpighian tubules opening round the pyloric valve. But, in the case of the pyloric valve I have never seen the contents of the hind-gut passing into the mid-gut.

On these grounds, I think that the terms 'Œsophageal and Pyloric Valves' are unfortunate misnomers. The question still

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<sup>1</sup> Wigglesworth (1930) while describing the formation of the peritrophic membrane in mosquito larvæ makes the following remark :— "At this point the œsophagus is invaginated into the mid-gut to form the structure usually referred to as the "œsophageal valve", an unfortunate term, that attributes to this part of the intestine a property which it does not possess, for the invagination acts not as a valve but as a sphincter." Q.J.M.S. (1930), p. 594.

<sup>2</sup> Kawalevsky (1887) has also stated in the case of a muscid larvæ that no food enters the annulus round the œsophageal valve.

remains as to what their function or functions are. I believe that the functions of these valve-like folds are: firstly, to shut<sup>1</sup> off an annular space round the valves for the opening of the glands (gastric caeca and malpighian tubules), so that the openings of these glands are prevented from being clogged by the food-contents; secondly, to act as a means of mechanical safety at the junction of two different parts of the gut.

## 7. THE MALPIGHIAN TUBULES.

The malpighian tubules are six in number. At their origin they are symmetrically placed and as already described, open separately at the anterior end of the annular space round the pyloric valve. A little beyond their origin they begin to surround the proximal lobe of the mid-gut and extend in the anterior direction on a very zig-zag and convoluted course, some reaching right up to the very base of the crop, whence they turn back to travel the same course along the proximal lobe, reaching again the level of their origin or in some cases even much posterior to that. Here they form two groups of three each and enter the fascia of the posterior region of the ileum. Beneath the fascia, they travel posteriorly, surrounding the colon much more intimately and in a much more convoluted manner than they do in the proximal lobe.

Posteriorly the malpighian tubules end blindly at the junction of the rectum and the colon within the fascia.

In a transverse section, a malpighian tubule consists of two or three cells surrounding a central lumen. The size of the cells appears to depend on their physiological activity. At some places, the cells are quite plump and bulge inwards so as to obliterate the lumen; at other places, the condition is reversed, i.e. the cells are contracted and the lumen is large. The cytoplasm of the cells is finely granular and shows a reticulate structure under the high power of the microscope. The nuclei are fairly large and well-defined, and stain deeply. The inner borders of the cells are beset with well-developed cilia which can be clearly seen projecting into the lumen.

If a slightly anaesthetized specimen is dissected in normal saline solution, the movement of the malpighian tubules can be studied with great interest. In a fresh dissection, some portions of the malpighian tubules look quite translucent, while others are **sometimes** opaque white. These opaque white portions contain solid white excretory products collected together in flexible rods lying within the lumen of the tubules. At times it is interesting to see solid excretory rods being moved quickly in periodic jerks within the lumen. This movement is most

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<sup>1</sup> This view has already been taken by Snodgrass (1935) in the case of the oesophageal valve.



probably effected by the cilia just described. This solid excretory material is often seen cut in transverse sections. The presence of calcium carbonate in the form of small granules or large calcospherites has been described by many writers in insect larvæ but in the adult insect, the presence of calcium carbonate has been observed only in *Drosophila funebris* by Eastham (1925): I have not found the condition observed in *E. Indica* described anywhere before.

### 8. THE SALIVARY GLANDS.<sup>1</sup>

There is a pair of salivary glands in *E. indica* (fig. 24). They are very fine tubular structures and consist of a chitinous tube

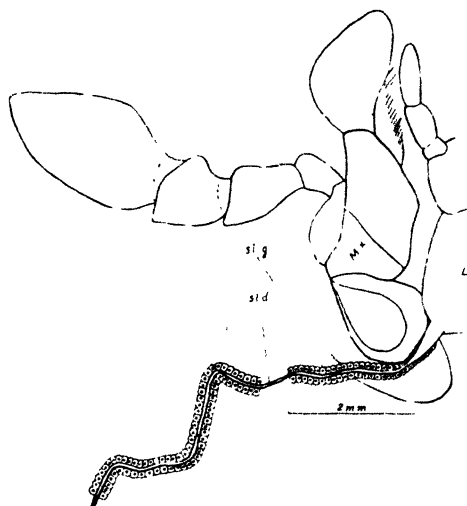


FIG. 24.—Portion of salivary gland (*sl.g.*), one maxilla (*mx.*) and part of labium (*la.*): *sl.d.*, salivary duct.

surrounded by a single layer of almost cubical cells. They open separately in the angles between the labium and the maxillæ, beneath the sides of the hypopharynx.

<sup>1</sup> The credit of observing these glands for the first time in the family *Coccinellidæ* goes to my friend Mr. R. L. Gupta. The American workers on *E. corrupta* have not described the salivary glands at all but we have found them in all the species of *Coccinellidæ* we have dissected.

*N.B.*—Further investigations after sending this paper to the press reveal that these glands are not true salivary glands, homologous with the labial glands of a generalized insect. These glands are the maxillary glands. Besides these there are other glands also which are true labial glands associated with the labium proper.—Pradhan (1937), *Cur. Sc.*, May 1937.

## 9. MATERIAL AND TECHNIQUE.

Specimens of *E. indica* are abundant in Lucknow during the months of August, September and the first half of October, when they can be collected in fields containing Cucurbitaceous plants, specially *Cucumis melo* var. *utilissimus*. For the present investigation, these insects were either brought fresh from the fields or were reared in the laboratory on cucumber leaves.

The insects were anaesthetized in KCN tubes and were at once dissected in normal (75%) saline solution. Different fixatives were tried but Bouin and Carnoy were found to be most satisfactory.

In cutting sections of the mid-gut and the hind-gut, simple embedding in paraffin wax was quite sufficient but in the case of the fore-gut double embedding (celloidin and paraffin wax) method was to be resorted to.

The stains used were Delafield hæmatoxylin, iron hæmatoxylin, and borax-carmin for the nuclei and eosin, indigo-carmin and orange G. for the cytoplasm.

The drawings were made with the help of the camera lucida.

## ACKNOWLEDGMENTS.

With great respect I wish to record my grateful thanks to Prof. K. N. Bahl, whose direct supervision, kind guidance and painstaking criticism have been very helpful in this investigation. His keen interest in the progress of the work has been a constant source of encouragement to me. I have also received considerable help and valuable criticism from Dr. H. S. Pruthi, Imperial Entomologist at the Imperial Institute of Agricultural Research, Pusa and I respectfully record my indebtedness to him. I am also very grateful to M. L. Bhatia, Esq., Lecturer in Zoology in the University of Lucknow for his kind help in various ways. My thanks are also due to the University of Lucknow for the grant of a Research-Fellowship for this piece of work.

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N.B.—I have not seen the papers marked with \* but I have referred to them on the authority of the quotations given by other authors.

*Zoology Department,  
The University of Lucknow,  
Lucknow, India.*



## EXPLANATIONS TO PLATE 4

FIG. 23.—A shred of the peritrophic membrane from the L.S. of the mid-gut (microphotograph).

FIG. 25.—T.S. (oblique) through the pyloric valve : (microphotograph) ; *h.ep.*, hind-gut epithelium ; *m.ep.*, mid-gut epithelium ; *pa.*, pad ; *mt.*, malpighian tubule.

FIG. 20*b*.—T.S. through the anterior portion of the proximal lobe showing the shedding off of groups of cells (*sl. ep.*)—a transition between the 'squeezing out' of individual cells and the sloughing off of the epithelium : (microphotograph).

FIG. 20*c*.—T.S. through the distal loop of the mid-gut showing the sloughed off epithelium (*sl. ep.*) within the lumen : (microphotograph).

FIG. 13*a*.—T.S. through the region of the sphincter behind the valve : (microphotograph) ; *c.m.*, circular muscles ; *ep.*, epithelium.

FIG. 22*b*.—Portion of epithelium from the anterior region of the proximal lobe (T.S.) showing the 'nuclear migration' and the throwing off of the nucleated masses of cytoplasm : (microphotograph) ; lettering as in Fig. 22*a*.

FIG. 19*b*.—T.S. from the distal loop of the mid-gut showing the squeezing out of individual cells (*i.e.*) : (microphotograph) ; *f.c.*, food cylinder.

FIG. 18*b*.—Portion of epithelium (T.S.) from the distal loop of the mid-gut showing the non-nucleated vesicles (*n.v.*) : (microphotograph).

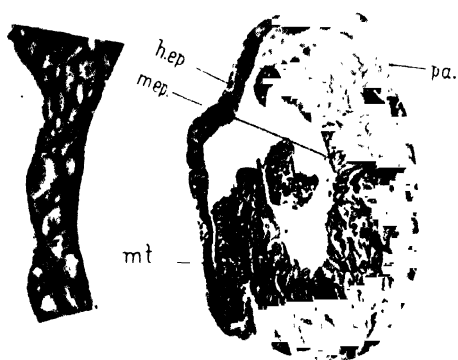


Fig. 23.

Fig. 25.

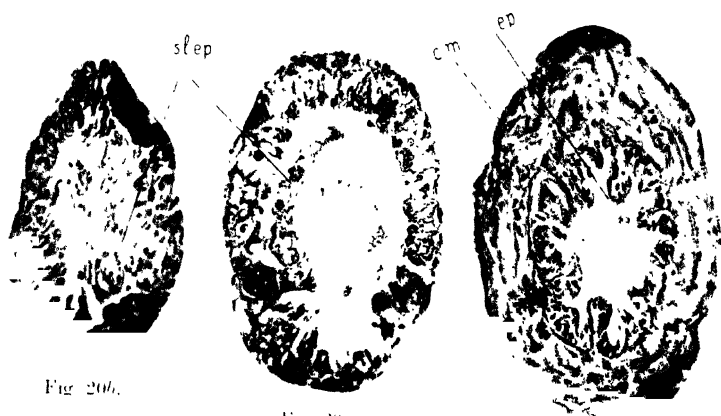


Fig. 20b.

Fig. 20c.

Fig. 13a.

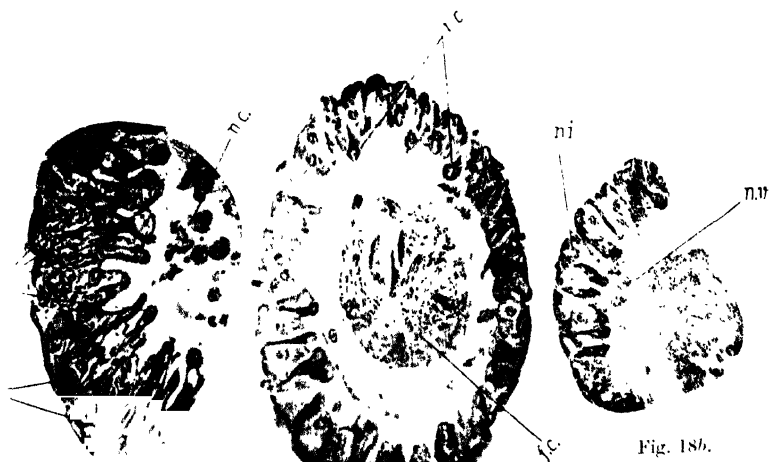


Fig. 18b.



### Abnormalities in Fishes.

By D. D. MUKERJI and K. KRISHNAN NAIR.

(Communicated by Dr. S. L. Hora, and published by permission  
of the Director, Zoological Survey of India.)

1. On a Brown Trout (*Salmo fario* Linn.), showing eversion of stomach into the pharyngeal cavity.

By D. D. MUKERJI.<sup>1</sup>

In January, 1936, the Zoological Survey of India was informed by the Divisional Forest Officer, Kagan Forest Division, Hazara District, N.W.F.P., of the very high mortality of fry in the local brown trout hatcheries: it was also stated that fishes over three years old die in fair numbers every now and then. To elucidate the cause of the mortality, the Divisional Forest Officer was requested to send properly preserved specimens of the fish and supply information regarding the ecological conditions under which the fish live. Unfortunately, no information was received except for 'a dead fish duly preserved in a 5% solution of formalin', which forms the basis of this note. This specimen is an adult male of *Salmo fario* Linn. with mature gonads, and is 15½ inches in total length. From its general appearance it seems to be a normal and healthy individual exhibiting no external abnormalities. A superficial examination of the specimen also revealed no apparent cause of death. On opening the pharynx of the specimen by cutting laterally through its left wall, a massive thumb-shaped structure, which at first sight appeared to be a large tumour or hernial sac, was, however, found lying in its cavity. A closer examination showed that this structure was formed as a result of the complete eversion and prolapsus of the proximal loop or the broad cardiac portion of the siphonal stomach into the pharyngeal cavity. The structures immediately following, viz., the spleen, the distal loop or the pyloric portion of the stomach, the duodenum, the pyloric caeca, the fat-bodies and some portion of the intestine are, as a result, pulled forwards and inwards and drawn into the everted sac in front of the gullet which also is everted and forms the posterior end of the sac. In view of the peculiar disposition of the various organs a detailed account of these abnormalities is

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<sup>1</sup> It may be noted that the author died before the paper was actually sent to the press, so the proofs were corrected by Dr. S. L. Hora.—  
Editor.



given below, and reference is also made to the probable mode of the ingestion of food in such abnormal specimens.

Attention may here be directed to a more or less similar abnormality recorded by Mudge<sup>1</sup> in a specimen of the dog-fish, '*Scyllium canicula*' (*-Catulus caniculus*).

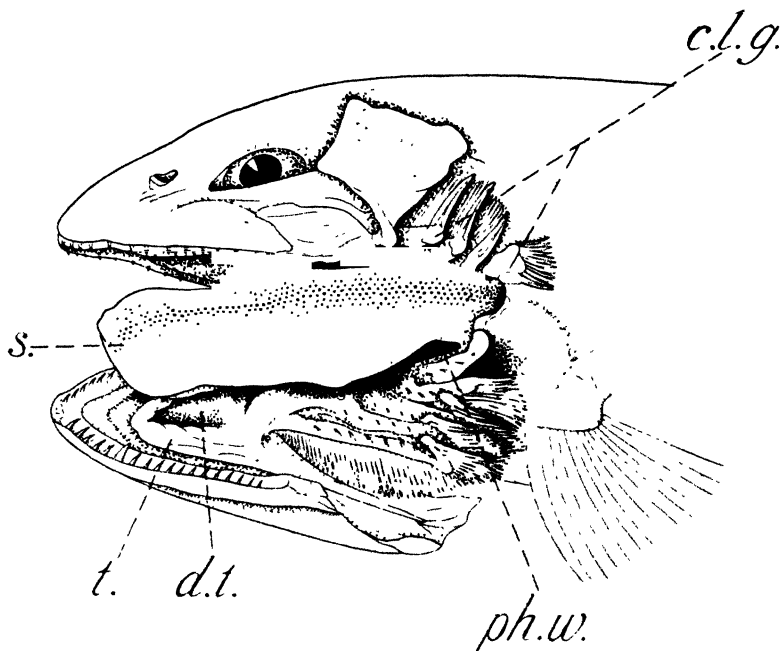


FIG. 1.—The left wall of the pharyngeal cavity of the abnormal trout cut open laterally to show the structure and position of the sac formed by eversion of proximal loop of stomach.

*c.l.g.*, cut portion of left gills; *d.t.*, depression on tongue; *ph.w.*, pharyngeal wall; *s.*, sac formed by eversion of proximal loop of stomach; *t.*, tongue.

*Description.*—The sac (text-fig. 1, *s.*) the outer wall of which represents, from behind forwards, a confluence of the everted inner walls of the gullet and of the proximal loop of the stomach, extends horizontally over and beyond the tongue (*t.*). It is somewhat tough, smooth and swollen. The structure is elongated, slightly depressed and 80 mm. long, 30 mm. broad and 20 mm. deep. It is broadly rounded anteriorly, deepest in the middle and rather constricted posteriorly, where it is lined by the pharyngeal wall (*ph.w.*). On cutting open the pouch laterally through its left wall (text-fig. 2, *p.l.st.*) past its attach-

<sup>1</sup> Mudge, Geo. P.—*Proc. Zool. Soc. London*, II, p. 490 (1905); *Zool. Anz.*, XXX, pp. 278-280, 1 fig. (1906).

ment with the pharyngeal wall, the spleen (*spl.*), the distal loop of the stomach (*d.l.st.*), the duodenum (*du.*), the pyloric cæca

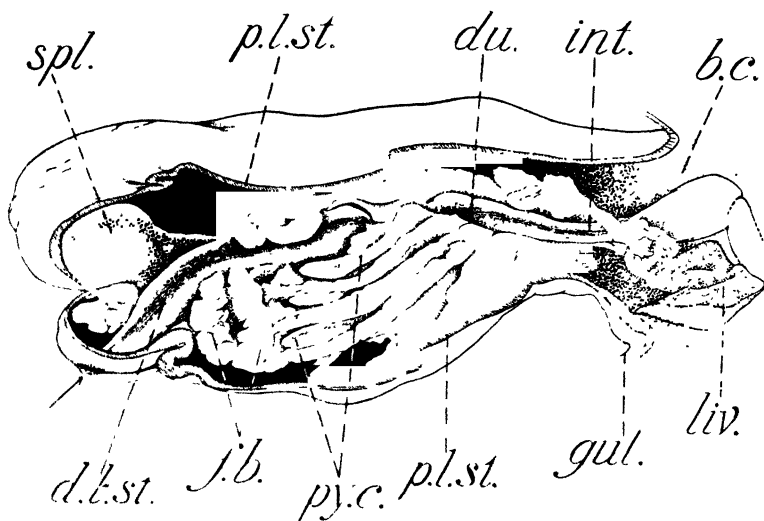


FIG. 2.—The sac formed by eversion of stomach cut open laterally through its left wall to show the disposition of structures within it *in situ*. Same size.

*b.c.*, body cavity; *d.l.st.*, distal loop of stomach; *du.*, duodenum; *f.b.*, fat bodies; *gul.*, everted gullet; *int.*, intestine; *liv.*, liver; *p.l.st.*, proximal loop of stomach; *spl.*, spleen; *py.c.*, pyloric cæca.

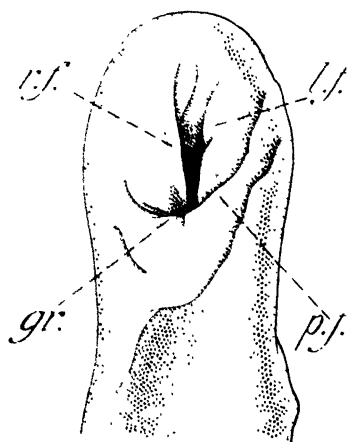


FIG. 3.—Ventral view of the sac showing the position of the invaginated median groove and the associated labiate folds. Same size.

*gr.*, groove; *l.f.*, left lateral fold; *p.f.*, posterior transverse fold; *r.f.*, right lateral fold.

(*py.c.*), the fat-bodies (*f.b.*) and a portion of the intestine (*int.*) are seen lying within the sac. As a result of eversion, an orifice is formed at the posterior end of the sac which opens into the body cavity (*b.c.*). Through this orifice the intestine, which is obviously pulled forwards roughly by twice the length of the everted sac, passes out into the body cavity and is continued along its normal course to the anus. The rest of the digestive organs behind the everted gullet (*gul.*) are normal, but the liver (*liv.*) is pulled forwards and comes to lie immediately behind the orifice.

A close examination of the outer surface of the seemingly closed everted sac revealed the existence, ventral to its anterior end (this position is indicated by an arrow in text-fig. 2), of a somewhat elongated (22 mm. in length), gaping slit or an invaginated median groove (text-fig. 3, *gr.*) bordered by a number of fairly deep folds and furrows. Of these, the right (*r.f.*) and the left (*l.f.*) lateral folds are thick, labiate and well defined. The posterior portion of the groove is partially roofed over by another broad suberescence, lip-like transverse fold (*p.f.*). In its normal position the groove lies superimposed over the normal depression of the tongue (text-fig. 1, *d.t.*). On passing a probe into the groove it was found to lead into the distal loop of the stomach which extends to the anterior end of the sac. Thus the groove appears as a 'pseudo'-gullet. In view of the fact that the proximal loop of the stomach is turned inside out over the distal loop, an invaginated groove of this nature appears to have been formed between and near the junction of the two loops.

*Remarks.*—The abnormalities observed by Mudge in the disposition of the lileo-gastric and the coeliac arteries must, *per se*, lead to the conclusion that the eversion of the stomach in the dog-fish was 'permanent' and that 'at quite an early stage of differentiation of the primitive gut, the proximal loop of the stomach probably became gradually everted . . . .'

The poor condition of the abnormal trout under report did not permit a detailed study of the arteries that supply the stomach and the spleen and it is, therefore, not possible to state definitely whether it represents a permanent abnormality similar to that recorded by Mudge, or a case of a sudden eversion which might have caused the death of the fish.<sup>1</sup> The condition of the other structures described above is, however, very similar to that observed by Mudge in the abnormal dog-fish.

Accepting Mudge's observations and admitting that the 'dog-fish must have lived with the inner surface of its stomach

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<sup>1</sup> Dr. Hora is, however, of the opinion that it represents a case of sudden eversion which caused the death of the fish through asphyxiation, for he believes that the abnormal disposition of the various organs described above is likely to interfere with the mechanism of normal respiration.

turned inside out and everted into the pharyngeal cavity', the question of the course of food in the abnormal specimen has to be considered. Mudge noted that 'the animal was fully nourished and the ovary was of normal size and laden with large eggs'. This naturally indicates that in spite of the critical nature of the abnormality, the dog-fish did not, as one would expect, suffer starvation and death, but continued to feed and was able to maintain its normal physiological balance. The true gullet of the dog-fish, as also of the abnormal trout, is, as a result of eversion and prolapsus, transformed into an inverted pocket in the buccal cavity. Passage of food through it is, therefore, a mechanical impossibility. The small 'slit-like aperture' or the invaginated groove towards the anterior end of the sac is the only passage or a sort of 'pseudo'-gullet that leads into the distal loop of the stomach. Ingestion of food through a groove of this nature seems improbable, but solution of the problem must await further research on similar abnormal specimens.

The specimen under report is preserved in the collection of the Zoological Survey of India, Indian Museum, Calcutta.

\* \* \*

2. On a specimen of *Silurus cochinchinensis* Cuv. and Val., showing eversion of stomach into the pharyngeal cavity.

By K. KRISHNAN NAIR.

In a small collection of fish made by Mr. V. P. Sondhi, Geological Survey of India, from the Southern Shan States, Burma, Dr. S. L. Hora found a specimen of *Silurus cochinchinensis* Cuvier and Valenciennes with a large tumour-like growth in the mouth. As Mr. D. D. Mukherji had recently studied a similar abnormality in a Brown Trout (*Salmo fario* Linn.), the specimen was given to him for a detailed report. On Mr. Mukherji's death Dr. Hora very kindly handed over the specimen to me for study.

I take this opportunity of recording my grateful thanks to Dr. Bains Prashad, Director, Zoological Survey of India, for affording me facilities for work and my great indebtedness to Dr. Hora for giving me an opportunity to report on such a rare abnormality and for his valuable suggestions.

The specimen under report is 191 mm. in total length and in general appearance seems to be quite healthy. The abnormality was noticed on account of its mouth being widely open through which a massive thumb-shaped structure could be seen. The structure extended right up to the jaws (Fig. 4, *ap.*) so that the mouth could not be closed even with some effort. When, however, the pharynx was cut open from the

side, the sac-like structure was fully exposed (Fig. 5). It was found to be broadly rounded and closed at the anterior end and

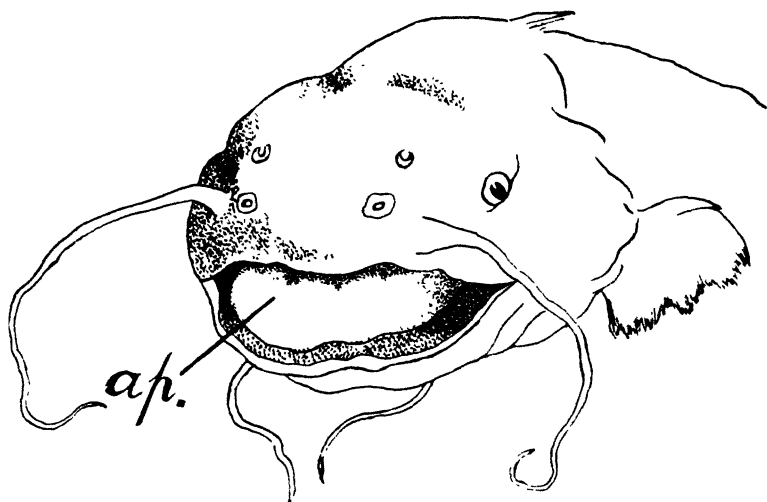


FIG. 4.—Head and mouth of the abnormal *Silurus cohocheimensis* Cuv. and Val., to show the position of the sac formed by the eversion of the stomach.  $\times 2$ .  
*ap.*, abnormal pouch formed by the eversion of the stomach lying in the mouth.

slightly tapering posteriorly where it terminated into a wide circular opening (Fig. 5, *po.*). It was 25 mm long, 14 mm

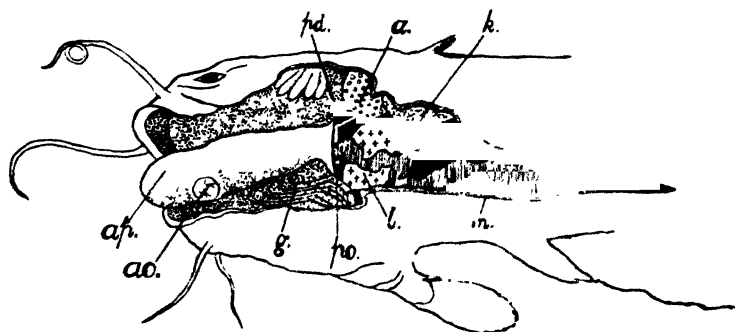


FIG. 5.—The left wall of the pharyngeal cavity of the abnormal *Silurus* fish cut open laterally to show the structure and position of the sac. Same size.

*a.*, air-bladder; *ao.*, anterior opening of the sac, protected by sphincter-like muscles; *ap.*, abnormal pouch formed by the eversion of the stomach; *g.*, gills; *m.*, intestine; *k.*, kidney; *l.*, liver; *pd.*, pneumatic duct; *po.*, posterior opening of the sac.

broad, and 8 mm. deep. On a closer examination another small opening (Fig. 5, *ao.*) with sphincter-like muscles, was found on the left hand side of the sac at some distance from its anterior blind end. The intestine came out of the posterior opening of the sac behind which the liver (Fig. 5, *l.*) was also situated.

On opening the sac from the side, duodenum, spleen, fat bodies, gall-bladder (Fig. 6, *gb.*) and a considerable length of

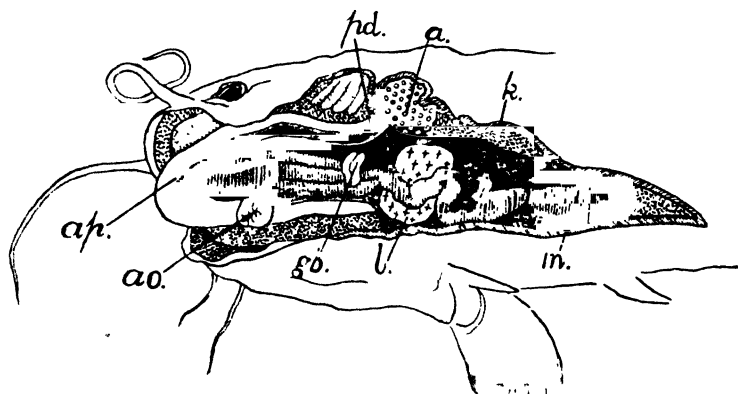


FIG. 6.—The sac formed by the eversion of the stomach cut open laterally through its left wall to show the disposition of structures within it *in situ*. Same size

*a.*, air-bladder; *ao.*, anterior opening of the pouch;  
*ap.*, abnormal pouch; *gb.*, gall-bladder; *in.*, intestine;  
*k.*, kidney; *l.*, liver; *pd.*, pneumatic duct.

the intestine were found lying inside the sac. The duodenum commenced from the small aperture already noticed on the outer side of the sac, and along with the intestine formed two incomplete loops inside the cavity of the sac. The pneumatic duct (Fig. 6, *pd.*) which connects the oesophagus with the air-bladder, was also found inside the sac of the abnormal specimen.

The abnormal positions of the various organs referred to above are similar to those described by Mudge<sup>1</sup> in a Dog-fish and by Mukerji in a Trout, and these have undoubtedly resulted from the eversion of the stomach into the cavity of the mouth. Mudge, from a detailed study of the vascular system, had concluded that the abnormality was of a permanent nature, whereas Mukerji, who had a poorly preserved specimen and could not, therefore, study the vascular system, did not come to any definite conclusion on this point. It was, however, indicated by him that a fish possessing such an abnormality could not

<sup>1</sup> Mudge, Geo. P. *Proc. Zool. Soc. London*, 11, p. 490 (1905); *Zool. Anz.*, XXX, pp. 278-280, 1 fig (1906).

feed properly. The abnormal specimen of *Silurus* is also in a poor state of preservation so that the details of its vascular system could not be studied. From the nature of the structures described above I am also of the opinion that it is impossible for the fish to catch any prey or to ingest any kind of food, especially on account of the massive bag-like structure in the mouth which practically fills the whole of the cavity.

Dr. Hora (*vide* Mukerji) has already expressed an opinion that an abnormality of this nature is caused by a sudden eversion of the stomach which would cause the death of the fish through asphyxiation. This view seems more probable, for all the abnormal specimens of this nature known so far, have been found to be quite healthy in all other respects.

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[Early in May, 1937, Dr. H. S. Rao of the Zoological Survey of India kept under shade in a rectangular glass aquarium of 5 gallons capacity about half a dozen young specimens of live *Glossogobius aureus* (Ham.), which had been taken from the Intake Chamber of one of the filter beds at the Pulta Waterworks, Calcutta. A few living specimens of *Viviparus bengalensis* had already been in the aquarium since the previous day. A couple of hours after the introduction of the fish, he noticed the presence of a fragment of a partially digested fish at the bottom. A few minutes later a second fragment consisting of the head portion of a fish was found, and on keeping a close watch he observed one of the *Glossogobius* opening its mouth widely to thrust out the partially digested remains of another fish. At the end of 3 hours he found 5 such fragments, which he removed from the aquarium. After about 6 hours all the fish were found dead.

The above observation shows that under certain unhealthy conditions the fish are capable of ejecting through the mouth the contents of the stomach. It is quite possible that sometimes this action may be so violent that the stomach may become everted into the cavity of the mouth. The abnormalities reported above by Mr. D. D. Mukerji and Mr. K. K. Nair are, in my opinion, the result of the same or some other similar action of the stomach. —S. L. HORA.]

## **On earthworm populations and the formation of castings in Rangoon, Burma.**

By MAUNG HLA KYAW and G. E. GATES.

The observations presented herewith were made on the Judson College compound in the Kokine quarter of Rangoon during the rainy season of 1935.

Two sample plots, each exactly ten feet square, about fifty feet apart, were marked off on an unshaded lawn. The soil in these plots is rather poor, all of the top soil have been removed in grading operations five years previously. The soil is lateritic, formed *in situ* from alluvial material under conditions of continuous high temperature and marked seasonality of rainfall, the silica and bases having been leached out leaving in the upper layer iron and alumina. The plots were covered by a coarse grass.

On the 25th of July all castings were carefully removed from the plots and discarded. From the western plot 56 *Eutyphoeus foratus* castings were removed, nearly all of which were open. From the eastern plot 37 *E. foratus* castings were removed. Some of these castings had been closed at the top or plugged throughout. For twenty days the castings were collected at irregular intervals during the daytime and allowed to dry out in the laboratory. Then, after the next heavy shower (so that the ground might be thoroughly soaked), a vermicide was applied to each plot. As the worms emerged they were collected, preserved and later identified. The worms first to appear, almost as soon as the vermicide was applied, were *E. foratus*.

Experimentation previously with vermicides had shown that when the ground is thoroughly soaked prior to application of the chemicals practically all of the worms are stimulated to come out onto the surface. At least digging, after application of the vermicides, has failed to turn up additional specimens. It is of course possible that some worms near the borders of the plots, having been slightly stimulated by the chemicals, withdraw into the untreated soil where they are able to remain in absence of further stimulation. No worms were seen to emerge on to the surface beyond an inch or two outside the boundaries of the plot. The number of specimens of *E. foratus* secured from each plot agrees roughly with the number of open castings secured from the plot at the beginning of the period. In these circumstances it is probable that all of the larger species of worms from both plots were collected. Specimens of small size, similar to that of *Dichogaster bolawi* or even smaller, may



have been concealed from view by the matted leaf blades and stalks of grass, and hence lost.

### EARTHWORM POPULATIONS.

From the first plot, that towards the west, 238 worms belonging to at least six species were collected.

Species.	Number of specimens.
<i>Drawida</i> sp. . . . .	1 juvenile
<i>Drawida rara</i> . . . . .	1 acitellate
<i>Pheretima planata</i> . . . . .	62 acitellate
<i>Pheretima campanulata</i> . . . . .	27 acitellate
<i>Octochaetoides birmanicus</i> . . . . .	11 clitellate
<i>Eutyphoeus foratus</i> . . . . .	50 clitellate
<i>Dichogaster bolani</i> . . . . .	22 acitellate 45 clitellate
<i>Dichogaster</i> sp. . . . .	19 juveniles
TOTAL . . . . .	238

From the second plot, that towards the east, 168 worms belonging to at least six species were collected.

Species.	Number of specimens.
<i>Megascolex mauritii</i> . . . . .	51 juvenile 16 acitellate 30 clitellate
<i>Octochaetoides birmanicus</i> . . . . .	11 clitellate
<i>Eutyphoeus foratus</i> . . . . .	23 clitellate
<i>Eutyphoeus</i> sp. . . . .	1 juvenile
<i>Dichogaster bolani</i> . . . . .	24 clitellate
<i>Dichogaster</i> sp. . . . .	11 juvenile
<i>Pontoscolex corethrurus</i> . . . . .	1 juvenile
TOTAL . . . . .	168

Estimates of earthworm populations per acre, on the basis of the number of individuals in the sample plots are 103,672 and 73,180, the average of the two estimates 88,426. These estimates may be compared with Hensen's figures for the Lumbricidæ (as quoted by Darwin, 1881, p. 159<sup>1</sup>) of 53,767 per acre.

Stephenson (1930, p. 627) believes that this figure is very small. However, it should be noted in connection with the Burmese estimates, that a number of the Rangoon species are fairly large, and that none, excepting only *D. bolani*, are really small. Thus strongly contracted, preserved specimens are frequently as large as indicated below.

<sup>1</sup> The page numbers are the same in the English and American editions.

Species.	Length.	Diameter.
<i>E. foratus</i> . . . . .	250 mm.	10 mm.
<i>M. mauritii</i> . . . . .	210 ..	5 ..
<i>O. birmanicus</i> . . . . .	140 ..	6 ..
<i>P. planata</i> . . . . .	170 ..	7 ..
<i>P. campanulata</i> . . . . .	200 ..	7 ..
<i>P. corcthrurus</i> . . . . .	120 ..	6 ..
<i>D. rara</i> . . . . .	80 ..	3 ..
<i>D. bolani</i> . . . . .	40 ..	2 ..

Furthermore, a very considerable proportion of the worms obtained from the plots are full grown or nearly full grown though not necessarily clitellate while practically all of the juveniles were sufficiently developed to enable specific identification. Juvenile specimens of *M. mauritii* from the east plot are 30-50 mm. long and 3-3½ mm. in diameter. Very young individuals if or when present might be expected to increase the numbers considerably.

#### CASTINGS.

Two types of castings were collected from the sample plots during the twenty day period. One of these types, frequently referred to as tower-like is formed by *Eutyphoeus foratus*. Castings of the second type are deposited in the form of piles of faecal strings more or less completely constricted transversely to form nearly spheroidal pellets. Castings of this type may possibly be formed at times by *O. birmanicus* though this species has not hitherto formed castings in the laboratory, whereas specimens of *M. mauritii* in the laboratory have formed castings practically identical with those collected on the plot. Furthermore the pellet type of castings was found only on the plot containing *M. mauritii* whereas *O. birmanicus* was present in both plots.

The castings from both plots were allowed to dry in the sunlight in the laboratory during four rainless months of the dry season and were then weighed. The total weight of dried castings from the west plot is 16.5 pounds. All of these castings are of the tower type and were formed by *E. foratus*. The total weight of the dried castings from the east plot is 11 pounds and 15 ounces of which 11.5 pounds are of the tower type and were formed by *E. foratus*, 7 ounces of the pellet type formed by *M. mauritii*. Castings were not collected on holidays or Sundays and heavy rains on those days as well as on other days and during the nights certainly washed away numbers of castings for which no estimate is possible. Thus on nine mornings on making the first collection of the day, small remnants of tower-like castings that had been formed and washed away during the night were noted.

In Rangoon the year may be divided into two seasons according to the rainfall; the rainy season comprising the months of May to October and the dry season comprising the months of November to April. The normal rainfall for May is 11.98 inches, for June to September, 15.27 to 21.42 inches per month, for October 6.91 inches. The normal rainfall for November is 2.79 inches, the other months of the dry season practically rainless. Towards the end of the rainy season, the ground begins to dry out as the result of the decrease in rainfall and increase in length of periods of sunshine and the earthworms begin to disappear, presumably retreating deep into the ground from whence they do not return to the surface until the next rainy season is well under way. Hence in monsoon portions of the tropics the formation of castings takes place only during a limited portion of the year. This period varies without doubt from year to year according to the weather. As it was impossible to carry on the observation on casting formation during the whole of the rainy season it is necessary, in order to derive estimates of per annum formation of castings, to use an arbitrary period. This has been set at 100 days. This period does not comprise the whole of the time in which castings are actually deposited. (Casting formation has been noted in June, throughout October and rarely in November.) It should however be noted that in the early and later portions of the rainy season, castings are not formed as often or as commonly as in the remainder of the period. We have further assumed that during the period of 100 days casting formation takes place at the same rate as during the August period of observations. If such an assumption is overconfident, it is at least partially compensated by the failure to secure all of the castings deposited during the twenty day period.

With these qualifications the estimates of the amount of dry earth deposited as castings are: as in the western plot, 16.043 tons per acre (open ground) per annum, all of which is brought up by one species only, *E. foveatus*; as in the eastern plot, 11.606 tons per acre, of which 11.181 tons is brought up by *E. foveatus* and 0.425 tons by *M. mauritii*. The average for the two plots, 13.824 tons per acre, the average for *E. foveatus* alone, 13.62 tons per acre.

These figures are to be compared with Darwin's estimates for the Lumbricidæ; of 7.56 tons per acre per annum on a terrace (Darwin, p. 167), of 16.1 tons on a common (p. 168), and 18.12 tons in a field at the bottom of a valley. The last estimate is possibly too high as the castings were only partially dried but on the other hand is based on a 'working period' of one half year which Darwin regarded as low. *E. foveatus* however in a period of 180 days would deposit 24.5 tons.

Tons and acres are perhaps rather difficult to visualize. More easily comprehended is an estimate based on the sample

plot size. Thus, *E. foveatus*, in a ten foot square plot, in one hundred days will bring up (as in the eastern plot) 57.5 pounds or (as in the western plot) 82.5 pounds. In the western plot each individual (of *E. foveatus*) must have brought to the surface during the twenty days an average dry weight of 0.33 pounds while in the eastern plot each individual must have brought to the surface, on an average, 0.5 pounds, during the same period. For a period of 100 days the averages for individual worms in the two plots are 1.65 and 2.5 pounds, or an average (weighted) per individual for the two plots of 1.917 pounds.

#### SUMMARY.

Estimates based on two sample plots ten feet square give an average figure of 88.426 earthworms per acre, belonging to eight species. Of these only two (*M. mauritii* and *E. foveatus*) formed castings. In one plot *M. mauritii* deposited seven ounces (dry weight) of castings in twenty days. In this same plot 23 specimens of *E. foveatus* deposited 11.5 pounds (dry weight) of castings in twenty days. In the other plot 50 *E. foveatus* deposited 16.5 pounds of castings. Casting formation for a period of one hundred days is estimated at 11.608 tons per acre (open ground), as in one plot or 16.04 tons as in the other plot, or an average of 13.824 tons per acre per annum. One individual *E. foveatus* is estimated (weighted average) to deposit 1.917 pounds (dry weight) of castings per annum.

#### REFERENCES.

- Darwin, C. Earthworms and the formation of vegetable mould. London, 1881. New York, 1882.  
 Stephenson, J. - The Oligochaeta. Oxford, 1930.

#### ADDENDUM.

During the rainy season of 1936 the Biology department of University College collected castings from a sample plot on the University College compound with the intention of ascertaining whether the problem was such as to justify further investigation. On learning of the previous work the collection of further castings was abandoned but the results already obtained were very kindly handed over by Prof. F. J. Meggitt, head of the department.

The sample plot is only a short distance to the east of the Judson College plots but the elevation is about 20 feet above that of the others though the soil is the same. The plot was marked out by measuring 27 feet in each direction from a four year old tree, *Mangifera indica* Linn. As the tree is now about 10 inches in diameter near the ground, the square marked off is somewhat greater than 18 yards in width though the plot is taken as measuring 54 feet on each side. An area nearly 16

feet in diameter is directly under the foliage of this tree while a circular area with a diameter of about 17 feet is shaded.

On July 28 all castings were removed from the plot and discarded. On the 29th and each day thereafter until and including the 19th of August, except on Sundays, the castings were collected at some time between noon and two o'clock. On days of heavy rainfall, 'over half the castings were in such a condition that they could not be collected'. In a circular area extending 6 feet on all sides from the tree trunk no castings were found. External to this central area there is a circular belt about  $1\frac{1}{2}$  feet wide under the foliage of the tree in which but few castings were found. Beyond this belt is another belt, about six inches wide and within the shade of the tree in which castings were more numerous though not as frequent as within the unshaded portion of the square. The castings collected are all tower-like and were formed by *E. foveatus*. No pellet-like castings were noticed.

The castings were allowed to dry in the laboratory until December 22 and were then weighed, the total weight of the castings from the sample plot, 73.75 pounds. For a period of 100 days it is estimated that in conditions similar to the sample plot 2,078 pounds per acre of dry earth would be deposited in the form of castings.

On the Judson College compound, near Prome Road, is a grove of trees with such dense shade that the ground is bare or almost bare throughout the rains. This area was under observation during the rainy season of 1936 and during that season no *E. foveatus* castings were found on the densely shaded bare ground, though *E. peguanus* castings were common and tower-like castings of certain species of *Pheretima* were occasionally found. Towards the edge of the grove on ground where grass was growing, *E. foveatus* castings were occasionally found. On other parts of the college compound *E. foveatus* castings have not been found, or have been found only rarely, on ground directly under trees, i.e., under the foliage, even though the lowest branches may be some distance from the ground.

On open ground with thick cover of grass intermingled with much sensitive plant (waste land) in the vicinity of the college, the foveatus castings are often very closely crowded, apparently as closely as on the Judson College sample plots.

*Judson College,  
Rangoon.*

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**Common Diatoms of the Loktak Lake, Manipur, Assam.**

By KALIPADA BISWAS.

Contributions towards the knowledge of the Diatom flora of the Indian Empire are rather scarce. Since the publication of Dr. Nellie Carter's 'Freshwater Algae from India', in the Records of the Botanical Survey of India, vol. IX, No. 4, 1926, and the writer's 'Census of Indian Algae—Scope of Algological Studies in India', published in the *Revue Algologique*, Tom VI, Fas. 2, 1932, no systematic attempt has been made towards revealing the enormous Diatom flora of the vast country.<sup>1</sup> Mr. Majid of the Punjab University notes forty-two species from the Punjab in his paper entitled 'A short note on the occurrence and the distribution of Diatoms in the Punjab', published in the *Journal and Proceedings of the Asiatic Society of Bengal* (new series), vol. xxix, No. 4, 1933. But the nomenclature he uses indicates that he has been working under the difficulty of not having sufficient literature. Such a difficulty confronts many a Diatom enthusiast in this country and the writer himself was not less handicapped for want of sufficient literature and type slides.

During the last twelve years I have managed to procure fairly exhaustive literature, and added these to the rare old standard works on this branch of algology preserved in the library of the Royal Botanic Garden, Calcutta. The writer is also in possession of the valuable microscopic slides of the authentic species representing most of the genera of these silicified members of Algae. These rare slides have been received from my revered teacher, the late Professor Paul Brühl, who purchased this collection from one of the German Diatom specialists. The writer acknowledges his deep debt of gratitude to his teacher by this paper. In the study of Diatoms two main difficulties are generally experienced—namely accurate determination of the specimens and the correct nomenclature to be adopted. Accurate identification of Diatoms depends upon sufficient material, upon detailed examination of as many forms as are available, both empty as well as living frustules, upon accurate detailed measurements and camera lucida drawings of the different views. It is necessary also to observe the number of markings, and to make comparison with authentic specimens. Some of the well known books such as Oltmann, Karsten, Fritsch, Smith,

<sup>1</sup> My account of the two interesting species of Diatoms in my paper on 'the Association of Algae and Animals' published in the *Hedwigia*, Heft 3, B and 76, 1935 is the last reference to this fascinating group of unicellular plants.

are useful for generic diagnosis. But a Diatomist must not fail to consult Kuetzing's *Phycologicæ Algarum* (Diatomaceæ) and the detailed specific descriptions in De-Toni's *Sylloge Algarum. Bacillariæ*, Sect. 1-111, 1891-1894; Van Heurck's *Synopsis des Diatomeés de Belgique* including his *Atlas*, 1880-1881; Wolle's *Diatoms of the U.S.A.*; Smith's *British Diatomaceæ*, vols. 1-11, 1853-1856; Schönfeldt and Hustedt's *Contributions to Diatom flora in Pascher's Süßwasser flora, Deutschlands, Österreichs und der Schweiz*; Hustedt's book in *Silicophyta*. As regards nomenclature this has become simplified by the publication of the recent outstanding works of Mill's *Index to the names of Diatoms*—a work indispensable to every Diatomist. To an Indian worker the lists appended to my paper on *Bacillariophyta*—reporting the previously recorded species together with the literature and a list of species which are likely to occur in India, might prove useful.

The specimens dealt with in this paper are found mixed with other Algae collected by Dr. S. L. Hora and the late Dr. N. Annandale, F.R.S., from the Loktak Lake, Manipur in 1920. The geographical and physiographical features of the Loktak Lake are discussed in the *Monograph 'Algae of the Loktak Lake'*, written in collaboration with the late Professor Paul Brühl, and published in the *Memoirs of the then Asiatic Society of Bengal*—now *Royal Asiatic Society of Bengal*, vol. viii, No. 5, pp. 257-316, with 22 plates and 170 figures, 1926. The specimens were preserved in spirits of wine for three years and subsequently transferred to 5% Formalin Alcohol (i.e. 5 c.c. of commercial Formalin and 95 c.c. Alcohol). This transference hardly improved their condition. The inner contents were nearly all destroyed as the figures illustrate. But empty shells were quite clear and this aided their determination. The type of vegetation in the Loktak Lake is particularly suitable for harbouring a Diatom flora and unicellular and colonial members of *Hydrodictyaceæ*. Although the *Desmid* flora was exceptionally rich, Diatom species seem to be far fewer than would be expected in such a place. The congestion of vegetation, leading to the physico-chemical condition of the water, prevented many free living and free floating species of Diatoms from flourishing. The abundance of *Gomphonema* species and other stalked and epiphytic species are of common occurrence in such areas. The fauna of the lake—particularly fishes and crustacea—is subservient to the particular type of aquatic *Phanerogams* and *Cryptogams* predominant. Also when the writer visited the lake in 1930 species of *Synedra* and *Gomphonema* appeared to be dominant. But further scrutiny of my collection provides a few more species to those already studied.

Both the Diatom flora as well as the *Desmid* flora of this region has some importance from the standpoint of distribution as the outlying district of Assam is close to Upper Burma.

Whether the Algal flora of this part of the country represents more of an Assamese element or a Burmese element—is a point which cannot be settled owing to our present imperfect knowledge of the algal flora of these two regions. But from the data so far available it can be stated that the algal flora, not unlike those of Phanerogams, is—in general—Malayan.

In systematic enumeration of the species short description has been added to each mentioned. Such a description has been supplemented wherever necessary with notes on nomenclature, particularly in cases of those specific names which demand clarification.

I express my sincere thanks to Sir William Wright Smith, Regius Keeper, Royal Botanic Garden, Edinburgh, for his kindly placing at my disposal all the available literature and thus enabling me to scrutinize the results of my study of these Diatoms. I am also indebted to Mr. R. Ross, Diatomist, British Museum (Natural History), London, for his co-operation in checking my determination with reference to the type slides.

#### DIAGNOSIS OF THE SPECIES.

##### 1 *Synedra ulna* (Nitzsch) Ehrnberg.

Frustules occurring in small fascicles or solitary mixed with other algae, attached to submerged waterplants, or free-floating, very variable in dimensions, 150 to 450 $\mu$  long, linear lanceolate, truncate, somewhat rostrate at both ends in girdle view, obtusely rounded in valve view, striations distinct, 9-10 in 10 $\mu$ .

Hab. Loktak Lake, Manipur, collected by N. Annandale and S. L. Hora, 1920, very common.

##### 2. *Synedra affinis* Kutz. var. *fasciculata* (Kuetzing) v. Heurck.

Frustules occurring in fascicles, rarely solitary mixed with other algae, attached to submerged plants or free floating, sometimes forming predominating species of plankton flora, valve view small lanceolate, narrowly fusiform, rounded or slightly thickened at both ends, obtuse or acute at the apices, girdle view linear, 37 $\mu$  long, broad at the middle, 3 $\mu$  wide at the apices, 20-25 striations in 10 $\mu$ .

Hab. Loktak Lake, Manipur, collected by N. Annandale and S. L. Hora, 1920, common.

The Loktak form is more obtuse at the apices and its systematic position is intermediate between the var. *fasciculata* and the var. *obtusata*. It approaches in shape more to var. *obtusata* as figured in Arnott's manuscript and printed in Synopsis des Diatomées de Belgique Par la Dr. Henri Van Heurck, Atlas Pl. XLI, fig. 12, (1880-1881).



### 3. *Eunotia lunaris* (Ehrenberg) Grunow.

Frustules long, arcuate, narrow in valve view, somewhat rostrate-capitate at both ends, in girdle view narrowly rectangular with truncate apices, 20 to 150 $\mu$  long, 3-4 $\mu$  broad, 14-17 striations in 10 $\mu$ .

Hab. Loktak Lake, Manipur, collected by N. Annandale and S. L. Hora, 1920, not very common.

The species is nearly always at first epiphytic, afterwards when dislodged—it is free-floating. Owing to its epiphytic nature being dominant Van Heurck puts this species in his key under the section 'an frustules parasites sur d'autres plantes'. Schönfeldt in Pascher's Süßwassr flora (Bacillariales). Heft 10, 1913, accepts Grunow's new combination *Pseudoeunotia lunaris* (Ehrenberg) Grunow, and places this species under the subgenus *Pseudo-eunotia* retaining however the original name *Eunotia lunaris* Ehrenberg. De Toni in his Sylloge Algarum, vol. 11, 1891, follows Grunow's nomenclature and describes this species under the name *Pseudo-eunotia lunaris* (Ehr.) Grun. The oldest name is *Synedra lunaris* Ehrenberg Abh. Berh. Akad. 1831. Grunow subsequently transferred the genus rightly to *Eunotia*. Van Heurck is therefore justified in adopting the combination—*Eunotia lunaris* (Ehrenberg) Grunow—which is consistent with the rules of nomenclature. The writer maintains Van Heurck's combination. Karsten in Engler's Die natürlichen Pflanzenfamilien. Band 2, Bacillariophyta 1928, does not seem to accept Grunow's view. Karsten reduces this genus *Pseudoeunotia* to *Amphicampa* Ehrenberg. F. W. Mills in 'An Index to the genera and species of the Diatomaceæ', p. 687, 1934, also adopts the combination *Eunotia lunaris* (Ehr.) Grun.

### 4. *Mastogloia Meleagris* (Kuetzing) Grunow.

Frustules lanceolate, elliptic, gradually attenuated towards sub-obtuse or obtuse apices, imperceptibly constricted at the poles, 36 to 57 $\mu$  long, 12 to 15 $\mu$  broad at the middle, 6 $\mu$  broad at the apices, 10 striations in 10 $\mu$ .

Hab. Loktak Lake, Manipur, collected by N. Annandale and S. L. Hora, not common.

The occurrence of this species in fresh-water lake is rather unusual. It is noteworthy to record this species from a lake like that of the Loktak lake, for the first time from India. Leudnger-Fortmorel reported its occurrence in the island of Ceylon. The lesser number of striations observed in the Loktak form may be due to physico-chemical nature of the water of the lake.

### 5. *Gomphonema constrictum* Ehrenberg.

Frustules in valve view cuneate, inflated at the middle, rounded at the upper end, obtuse at the lower, more or less

constricted towards the upper extremity, attenuated below,  $4\mu$  broad at the narrow base; girdle view conical, obtuse at the base, gradually uniformly wider at the apices, mucilage stalks long,  $3\mu$  wide, hyaline, dichotomously branched, often bearing at the apex a pair of frustules,  $45\mu$  long,  $15-18\mu$  broad.

Hab. Loktak Lake, Manipur, collected by N. Annandale and S. L. Hora, 1920, very common—attached to submerged plants.

6. **Gomphonema acuminatum** Ehrenberg. var. *elongata* W. Smith.

Frustules in valve view elongate, cuneate, gradually attenuated below, slightly swollen at the middle, not constricted towards the upper extremity, somewhat apiculate above, girdle view cuneate, constriction obovate,  $90\mu$  long,  $18\mu$  broad, 9-10 striations in  $10\mu$ .

Hab. Loktak Lake, Manipur, collected by N. Annandale and S. L. Hora, 1920, rather common.

7. **Gomphonema olivaceum** (Lyngbye) Kuetzing.

Frustules lanceolate, attenuated at both ends, apex rounded, base acute,  $2-3\mu$  wide, girdle view cuneate, 36 to  $45\mu$  long,  $3-9\mu$  broad, 10-15 striations in  $10\mu$ .

Hab. Loktak Lake, Manipur, collected by N. Annandale and S. L. Hora, not very common.

8. **Epithema Zebra** (Ehrenberg) Kuetzing.

Frustule in valve view arched, attenuated at both the extremities, obtusely rounded at both ends; girdle view rectangular, truncate at the apices, 39 to  $51\mu$  long, 9 to  $15\mu$  broad, 4 rather robust striations in  $12\mu$ .

Hab. Loktak Lake, Manipur, collected by N. Annandale and S. L. Hora, not common.

9. **Rhopalodia gibba** (Ehrenberg) O. Müller.

Frustule in valve view linear, slightly inflated at the middle, rounded at both ends; girdle view linear obtuse, 70 to  $80\mu$  long, 20  $24\mu$  broad,  $15\mu$  wide at both extremities, markings robust, 12 to 15 in  $10\mu$ .

Hab. Loktak Lake, Manipur, collected by N. Annandale and S. L. Hora, not common.

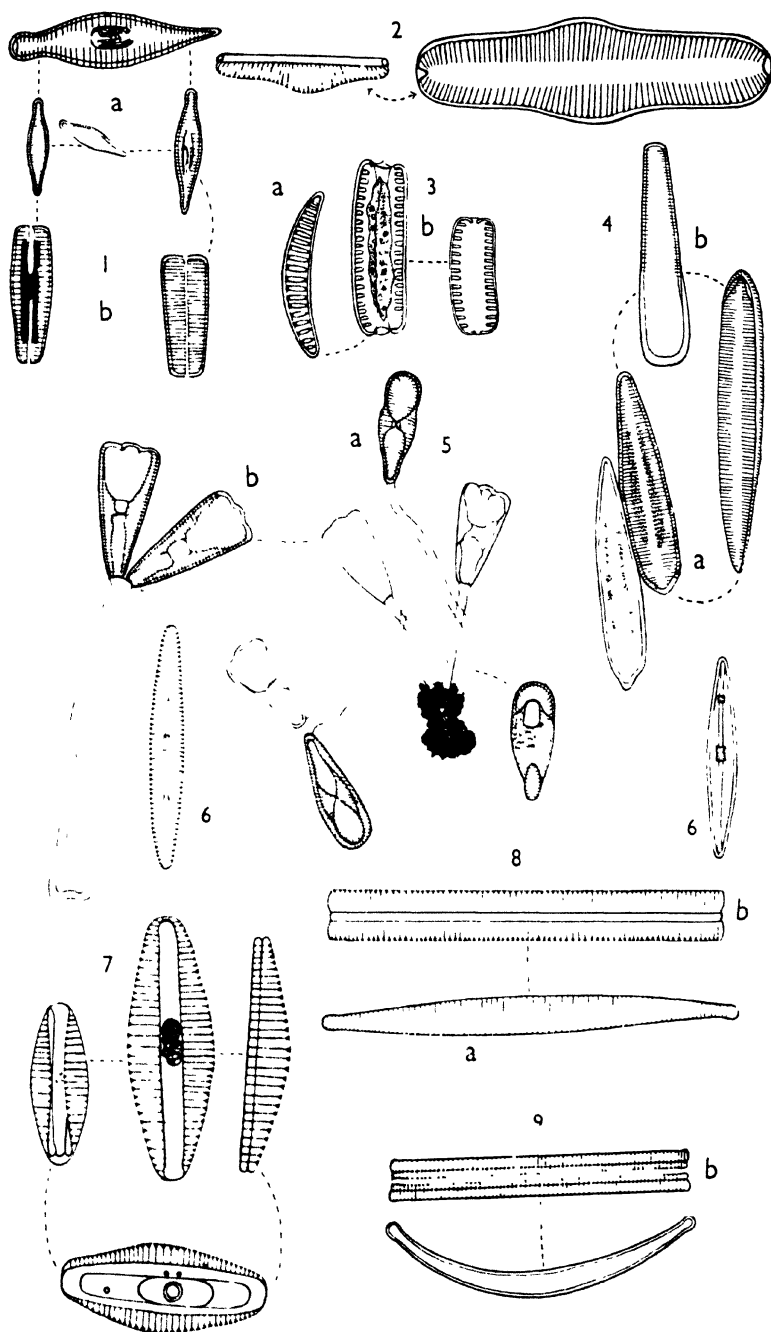
Royal Botanic Garden, Edinburgh.

23rd November, 1936.



## EXPLANATION TO PLATE 5

- FIG. 1.—*Gomphonema olivaceum* : (*a*) valve view, (*b*) girdle view  $\times 900$ .  
 „ 2.—*Rhopalodia gibba*, valve view  $\times 600$ .  
 „ 3.—*Epithemia Zebra* : (*a*) valve view, (*b*) girdle view  $\times 500$ .  
 „ 4.—*Gomphonema acuminatum* var. *elongata* : (*a*) valve view, (*b*)  
     girdle view  $\times 350$ .  
 „ 5.—*Gomphonema constrictum* : (*a*) valve view, (*b*) girdle view  $\times 350$ .  
 „ 6.—*Synedra affinis* var. *fasciculata*  $\times 800$ .  
 „ 7.—*Mastogloia Meleagris*  $\times 225$ .  
 „ 8.—*Synedra ulna* : (*a*) valve view, (*b*) girdle view  $\times 500$ .  
 „ 9.—*Ennotia lunaris* : (*a*) valve view, (*b*) girdle view  $\times 600$ .





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**YEAR-BOOK**  
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**ROYAL ASIATIC SOCIETY OF BENGAL**

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**VOLUME II**

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**YEAR-BOOK**  
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**ROYAL ASIATIC SOCIETY OF BENGAL**  
**VOLUME II**  
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**1938**



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**(Complete.)**



## NOTICE

His Majesty, the King Emperor, has been graciously pleased to grant permission to the Asiatic Society of Bengal to use the title 'Royal' before its name.

The Society, therefore, will henceforth be known as the 'Royal Asiatic Society of Bengal', and the *Journal* and *Year-Book* will be called *Journal of the Royal Asiatic Society of Bengal* and *Year-Book of the Royal Asiatic Society of Bengal*, and the abbreviations for references will be . JRASBL.; JRASBSc.; and YBRASB.

CALCUTTA,  
1, PARK STREET,  
August, 1938.

JOHAN VAN MANEN.  
*General Secretary,*  
*Royal Asiatic Society of Bengal.*





# Year-Book, Royal Asiatic Society of Bengal, 1935.

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# PROCEEDINGS OF THE ANNUAL MEETING, 1936.

## FEBRUARY.

The Annual Meeting of the Asiatic Society of Bengal was held on Monday, the 3rd February, 1936, at 5-30 p.m.

### PRESENT.

SIR LEWIS FERMOR, Kt., O.B.E., A.R.S.M., D.Sc., F.G.S., M.INST.M.M., F.R.S., F.A.S.B., President, in the Chair.

#### Members :

Agharkar, Dr. S. P.  
Barwell, Lt.-Col. N.  
Bent, Mr. W. A.  
Bhose, Mr. J. C.  
Biswas, Mr. Kalipada  
Bogdanov, Mr. L.  
Bose, Mr. M. M.  
Brahmachary, Rai Bahadur S. C.  
Brown, Mr. Percy  
Calder, Mr. C. C.  
Chakladar, Mr. H. C.  
Chakravarti, Mr. C.  
Chanda, Rai Bahadur R.  
Chatterjee, Mr. P. P.  
Chatterji, Dr. S. K.  
Chopra, Brevet-Col. R. N.  
Darbari, Mr. M. D.  
Datta, Mr. H. N.  
De, Mr. K. C.  
Dey, Mr. Mukul  
Dunn, Dr. J. A.  
Ezra, Sir David  
Gee, Mr. E. R.  
Ghose, Mr. T. P.  
Ghosal, Mr. U. N.  
Gladstone, Mr. J.  
Heron, Dr. A. M.  
Hobbs, Mr. H.  
Hora, Dr. S. L.

Hosain, Dr. M. H.  
Jack, Hon'ble Mr. Justice R. E.  
Klebe-Brandt, Dr. A.  
Knowles, Lt.-Col. R.  
Ledrus, Rev. Fr. M., S.J.  
Mahindra, Mr. K. C.  
Mahtab, Maharaj-Kumar U. C., of  
Burdwan  
Majumdar, Mr. N. G.  
Manen, Mr. Johan van  
Mitter, Mr. S. C.  
Modi, Mr. J. R. K.  
Mukherjee, Dr. J. N.  
Mullick, Mr. M. L.  
Olpadvala, Mr. E. S.  
Pasricha, Capt. C. L.  
Rahman, Mr. S. K.  
Rao, Mr. U. S.  
Rossetti, Mr. F. F.  
Singh-Roy, Lt. S.  
Sinh, Kumar Raghubir  
Sinha, Kumar S. C.  
Sircar, Mr. Ganapati  
Sommerfeld, Mr. A.  
Stapleton, Mr. H. E.  
Urquhart, Dr. W. S.  
Vidyabhusan, Mr. A. C.  
Wadia, Mr. D. N.  
Wilson, Dr. H. E. C.

and others.

#### Visitors :

Barwell, Mrs.  
Basak, Dr. M. N.  
Basu, Mr. B. K.  
Bhose, Mr. S.  
Bingham, Mr. George E.  
Bishop, Mr. H. C. W.  
Bishop, Mrs.  
Biswas, Mrs. K. P.  
Biswas, Mr. P. C.  
Bose, Dr. G. S.  
Chatterjee, Dr. M. M.  
Covaloff, Miss O.

Deuster, Mr. R. H.  
Dutt, Mr. D.  
Dutt, Mr. S. C.  
Ellis, Mr. Norman A.  
Emanuelov, Mrs.  
Fermor, Lady  
Flury, Mr. E. C.  
Francoil, Mr. J. H.  
Gee, Mrs.  
Ghose, Mr. D. C.  
Hand, Dr. Henry  
Holy, Dr. Ing. Ian

*Visitors :*

Innes, Mr. C. A.	Ray, Mrs.
Kar, Mr. Haridas	Richardson, Mr. J. H. S.
Khan, Mr. N. Ali	Ross, Mr. J. B.
Khanna, Mr. K. L.	Sinha, Mr. R. K.
Knight, Rev. P.	Sommerfeld, Mrs. A.
Knight, Mrs.	Spencer, Dr. E.
Lacey, Mrs. Patrick	Thomas, Mr. R. A. S.
Mitter, Mr. N. C.	Townend, Mrs.
Ojha, Mr. Amrit Lal	Urquhart, Mrs.
Patterson, Hon'ble Mr. Justice D. C.	Verstraeten, Rev. Fr. A., S.J.
Rankin, Mrs. E. H.	Worthington, Mr. R. H.
Ray, Dr. H. N.	

and others.

The President in declaring the Annual Meeting open said :—

‘ LADIES AND GENTLEMEN,

I have to my regret to announce that H.E. the Governor, our Patron, is prevented from attending our meeting on account of absence from Calcutta. He has, however, expressed his good wishes for the success of our function and it is my pleasant duty to communicate this message to you.’

The President ordered the distribution of the voting papers for the election of Officers and Members of Council for 1936, as well as the voting papers for the election of Ordinary Fellows proposed by Council, and appointed Messrs. H. Hobbs and L. Bogdanov to be scrutineers.

The Annual Report was then presented. (See page 44).

The retiring President then delivered his Annual Address. (See page 9).

The President called upon the scrutineers to report and announced the result of the Council Election. (See page 33).

The President said :—

‘ LADIES AND GENTLEMEN,

I now announce the result of the Council vote. On the report of the scrutineers I have the pleasure to declare all the candidates for the next year set forth in the ballot paper duly elected.

I would propose that in communicating his election as President to His Excellency, the Governor of Bengal, we should express our thanks to him for having given us the permission to do so.

By this election we have revived an old tradition, as the Society during its long career has had the honour of having three Viceroys and five Governors of Bengal as its Presidents. Sir John Anderson himself is a scholar of considerable distinction, and science has lost what Government has gained by the circumstances of his career.

As I have not stood for re-election to the Council on account of my impending departure from India, I will now vacate the

Chair and request Sir David Ezra, the Senior Vice-President present, to occupy it in the unavoidable absence of our new President.'

Sir David Ezra said :—

'I think that as this is probably the last time that we shall have the privilege of the presence of Sir Lewis Fermor in our midst, I express the desire of all present in proposing that he should continue to occupy the Presidential Chair for the rest of the evening.'

The Meeting agreed, and Sir Lewis resumed the Chair.

The Chairman then made the following announcements :—

'I have now great pleasure in announcing that, having heard the report of the scrutineers, I declare the following Ordinary Members :—

Dr. S. K. Chatterji,  
Dr. A. M. Heron,  
Mr. N. G. Majumdar, and  
Nawab Habib-ur-Rahman Shirwani,

to have been duly elected Ordinary Fellows of the Asiatic Society of Bengal.'

'I have now to announce that papers from six candidates have been received in competition for the Elliott Prize for Scientific Research for the year 1935 which was for Geology and Biology, including Pathology and Physiology and the Trustees have judged the papers of one candidate deserving of the award.

The prize for the year is accordingly awarded to Mr. Kalipada Biswas of Royal Botanic Garden, Sibpore, for meritorious publications on the subject of Botany.

The prize for 1936 will be for work in Mathematics regarding which a detailed announcement has been published in the *Calcutta Gazette* and the *Bihar and Orissa Gazette*.'

The Chairman conveyed his hearty congratulations to Mr. Biswas.

The Chairman then said :—

'My next announcement regards the Barclay Memorial Medal. This medal is awarded biennially for conspicuously important contributions to Medical or Biological science with special reference to India.

This year the medal is awarded to Dr. Birbal Sahni, Professor of Botany, Lucknow University, for his long-sustained and distinguished labours in the field of Botanical research.'

'My next announcement regards the Joy Gobind Law Memorial Medal. This medal is awarded every three years for conspicuously important contribution to the knowledge of Zoology in Asia. This year the medal is awarded to Professor Lew Semenowitch Berg, Chief of the Bureau of Applied Ichthyology and Professor of Geography, State University, Leningrad, Russia.'

After these announcements the Chairman declared the Annual Meeting to be dissolved and invited the guests present to examine the collection of exhibits (see page 34) and the members present to reassemble round the table for the Ordinary Monthly Meeting for the election of Members and transaction of business.

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# ANNUAL ADDRESS, 1935-36.

## THE DEPLETION OF INDIA'S COAL RESERVES.

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### I. INTRODUCTION.

We are met here this afternoon under the shadow of a great sorrow, the death of our beloved King George V. This Society is now in the 153rd year of its existence, having been founded in the reign of King George III and whilst Warren Hastings was Governor-General of India. We have seen the passage of six monarchs in Britain and of 32 Governors-General in India, and have thus become a part of the history of British India. In spite of wars and other vicissitudes of history, this Society has been enabled to carry on unhampered its fruitful labours of scholarship and research. Not only, therefore, as loyal subjects



do we grieve at the passing of His Majesty King George V, but as grateful beneficiaries of the system of Government that he personified. We also extend our deepest sympathies to Queen Mary, and to the new King-Emperor, Edward VIII, in their personal loss. In extending this sympathy we also welcome our new King, and pray that during his reign the conditions may continue that render possible the peaceful researches of men of letters and of science, and the fruitful production of works of art by those who are suitably gifted.

Two days before the death of King George occurred that of Rudyard Kipling. With the almost simultaneous passing of these two notable personalities it will seem to many that an era in British history has come to an end.

It is the practice for the President of your Society to deliver an Address at the annual meeting held customarily on the first Monday in February. This privilege falls to my lot once more.

The General Secretary has already given you a résumé of the report of the Council of the Asiatic Society of Bengal upon the progress of the Society during the calendar year 1935. There are no special points in this account that require further elaboration by me, but it is necessary to refer to the death of three of our Fellows—two during the year 1935, and one at the beginning of this year.

The senior of these was Dr. P. J. Brühl, who has been a member of this Society since 1909 and a Fellow since 1912. After a distinguished career in Calcutta, first at the Engineering College, Sibpur, and later at the University of Calcutta, Dr. Brühl retired to Bangalore, where he resided until his death. Brühl was known not only for his original researches in Botany, but was a competent exponent of several other branches of science including Geology and Physics. One of the medals of the Society, the Paul Johannes Brühl Memorial Medal, has been named after him.

Whilst Brühl left us in the fulness of years, Lt.-Col. H. W. Acton, a member of the Society since 1921 and a Fellow since 1930, has died long before the allotted span of life, thereby depriving the School of Tropical Medicine, Calcutta, of a chief whose versatility in medical research has long been a source of inspiration to the school.

Since the year ended, we have lost a third Fellow, namely Dr. A. C. Woolner, Vice-Chancellor of the University of the Punjab and known throughout India for his oriental scholarship. Woolner had been a member of the Society since 1906 and a Fellow since 1927.

I will now refer to a matter that will be a source of pleasure and gratification to you all, namely that my successor in this Chair is to be His Excellency Sir John Anderson, Governor of Bengal, who has hitherto been on our rolls as a Patron, but has recently been elected an Ordinary Member of the Society.

It may interest you to learn that on several occasions in the past we have been honoured by either the Viceroy or the head of the Province of Bengal accepting the office of the President of this Society: The following is a list :—

Sir John Shore (later Lord Teignmouth), Governor-General of India ..	1794 to 1797
The Earl of Moira (later Marquess of Hastings), Governor-General of India..	1815 to 1820
Sir Henry Hardinge (later Lord Hardinge), Governor-General of India ..	1844 to 1847
Sir Ashley Eden, Lieutenant-Governor of Bengal .. .. .	1881 to 1883
Sir Charles Elliott, Lieutenant-Governor of Bengal .. .. .	1893 to 1894
Sir John Woodburn, Lieutenant-Governor of Bengal .. .. .	1900 to 1902
Sir Andrew Fraser .. .. .	1905 to 1907
Lord Carmichael, Governor of Bengal ..	1913 to 1915

We shall all be glad to welcome the addition of Sir John Anderson's name to this illustrious list; it will be especially fitting that Sir John, as His Majesty's representative in Bengal, should be President when the Society receives the honour of being permitted to prefix the title 'Royal'.

## II. THE DEPLETION OF INDIA'S COAL RESERVES.

A perusal of the records of our Society will show that the Address of the President at the annual meeting is normally devoted to a subject of academic interest, either in arts, letters or science: and last year I addressed you upon the development of scientific research in India to the end of the nineteenth century, thereby conforming to the normal. This trend arises not from any rule of the Society, but from its usual interests. According, however, to the paraphrase of the well-known passage in the original Address of our Founder, Sir William Jones, describing the objects of our Society :

'The bounds of its investigations will be the geographical limits of Asia, and within these limits its enquiries will be extended to whatever is performed by man, or produced by nature.'

This year I propose to address you upon one of the products of nature, namely coal, in one of its economic aspects, namely the available resources of coal in India, and the fact that the quantity of this substance 'produced by nature' that will become available for use by man depends upon the manner in which mining operations are 'performed by man'.

When I arrived in India in the fall of 1902, the mineral industries of India were still in their comparative infancy, as is shown by the fact that the average annual value of the total Indian production of all minerals was only £4,253,706, the value for 1903 being £4,988,527. From then onwards successive quinquennial periods showed a rapidly increasing total value until the period 1919-1923, as is shown by the following figures :—

Period.	Average annual value of total mineral production of India.	Average annual value of coal production of India.	Ratio of value of coal production to total value.
	£	£	Per cent.
1898-1903 ..	4,253,706	1,225,677	28·8
1904-1908 ..	6,716,325	2,139,249	31·8
1909-1913 ..	8,393,222	2,969,305	35·4
1914-1918 ..	11,822,743	4,419,174	37·4
1919-1923 ..	24,615,727	9,252,649	37·6
1924-1928 ..	23,875,578	8,305,764	34·8
1929-1933 ..	17,368,567	5,875,009	33·8
1934 ..	17,700,015	4,741,425	26·8

The year of maximum production was 1924 with a total value of £27,683,898.

During the same 36 years (1898-1933) the average annual value of the coal produced rose from £1,225,677 in the period 1898-1903 to £9,252,649 in the period 1919-1923, falling to £5,875,009 in the period just ended. The year of maximum value of production of coal was also 1924, with a value of £10,766,433. The ratio of the value of the coal production to that of all minerals including coal has ranged between 28·8 per cent. and 37·6 per cent. with an average value of 35·2 per cent. for the 7 periods (36 years) or 33·9 per cent. if 1934 be included. These figures illustrate vividly the value of the coal industry to India.

The variation in the annual value of the coal production of India is due, of course, partly to variations in the quantity of mineral won and partly to variations in market price per ton. This can be seen by comparing the figures of average annual value given above with the following figures of average annual production and average pit's mouth value per ton for the same periods :—

Annual production of coal.

Period.				Average annual production.	Average pit's mouth value per ton.
				Tons.	Rupees.
1898-1903	..	..	..	6,219,790	2.95
1904-1908	..	..	..	10,066,934	3.19
1909-1913	..	..	..	13,509,472	3.30
1914-1918	..	..	..	17,951,583	3.69
1919-1923	..	..	..	19,712,213	6.25
1924-1928	..	..	..	21,540,607	5.21
1929-1933	..	..	..	21,776,153	3.61
1934	..	..	..	22,057,447	2.86
Years of maximum production—					
1919	..	..	..	22,628,037	4.50
1930	..	..	..	23,418,734	3.875
Year of maximum price—					
1922	..	..	..	19,010,986	7.69

From a study of these figures it is seen that the increase in the total annual value from 1898 to 1918 is due mainly to large increases in the quantity of coal produced aided by a slowly rising value per ton. During the next period 1919 to 1923, there was a proportionately smaller increase in the average annual production but an enormous increase in value of the annual coal production due mainly to a very great increase in price, which reached its maximum in 1922 at Rs. 7.69 per ton. The high prices during this period were at least in part due to wagon shortage. Since then the value of the total coal production has fallen steadily due to falling prices per ton on a roughly steady output, averaging  $21\frac{1}{2}$  to 22 million tons from 1924 to 1934.

Now this great increase in the average annual output of coal from 6.2 million tons in the period 1898-1903 to 21.5 million tons in the period 1924-1928, or from 4.6 million tons in 1898 to 22.6 million tons in 1919, has meant great activity in the development of already opened coalfields, particularly of the Jharia and Raniganj fields, and of the building of railways to new fields that were not producers at the beginning of the period under discussion. The new fields developed have been Pench Valley (1903), Ballarpur (1904), Bokaro (1909), Rampur (1910), Jainti (1915), Sasti (1920), Sohagpur (1921), Talcher (1923), Karanpura (1925), Korea (1930), Tandur (1931).

In retrospect it is evident that the rapid expansion in the demand for Indian coal that prevailed up to 1919 when the output reached 22.6 million tons was not to continue, for the production of 1934

was only 22.1 million tons. And as the coalfields of India opened in 1919 were able to cope with the existing requirements as well as to develop for the future, the coalfields that have been developed since this date, six in number, have caused a position of potential over-production. As these six coalfields between them were responsible for the production of over  $1\frac{1}{2}$  (1.54) million tons in 1934, whilst the five fields opened between 1903 and 1915 have increased their production by over  $1\frac{1}{2}$  (1.58) million tons between 1919 and 1934, we have a statistical reason for the depression in the coalfields of Bengal and Bihar and Orissa of recent years. Irrespective of source, the total output of coal in India for the 36 years, 1898 to 1933, has been 553,883,760 million tons or 575,941,207 tons to the end of 1934, or probably nearly 600,000,000 tons to the end of 1935.

What is of great concern to us is the effect of these factors upon the available reserves of coal in India. This problem has been a matter of concern both to the Government of India and to the public in India for some years and has been in particular a matter of study by the Geological Survey of India ; for it is common knowledge that the methods of work in many of the coal mines in India have for many years been such as do not commend themselves to geologists and competent mining engineers. And the tales of fire, flood and subsidence from the Jharia coalfield in particular and the evidence visible to all in the shape of pillars of cloud by day and of fire by night show that the extraction of some 600 million tons of coal between 1898 and the end of 1935 must have meant the depletion of available reserves to a vastly larger extent.

The Government of India became aware of the situation in the coalfields of Bengal and Bihar and Orissa as long ago as 1917 and engaged a competent Mining Engineer from England, Mr. R. I. Treharne Rees, to report on the position, which he did in 1919.<sup>1</sup> Mr. Rees directed his attention to four problems :—

- (1) Methods of extraction,
- (2) The generation of power at the collieries,
- (3) Coking,
- (4) Handling and despatch of coal at the collieries,

and found that considerable economy could be effected under each head. As improvements under (2), (3) and (4) would apply only to the coal extracted from the ground, it was evident that the principal necessity was to improve the methods of extraction and decrease the very serious losses that Mr. Rees reported as

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<sup>1</sup> 'Report on the Methods of Coal Mining in India', pp. 1-12 with Appendix on Hydraulic Stowing, pp. 1-5, Calcutta, (1919).

existing. To effect this Mr. Rees advocated the extensive introduction of hydraulic stowing in the Jharia and Raniganj coalfields, and wrote a special appendix to his report on this method, in which he estimated that in the case of new workings where the coal was not already cut into pillars the cost of sand stowing would be from 10 to 14 annas per ton of coal whilst in the case of extracting pillars already formed, it would be 16 to 20 annas per ton.

For those not versed in mining practice I should explain that the majority of the Indian coal mines are worked on the bord and pillar system, in accordance with which a seam is opened up by driving galleries in two sets at right angles isolating rectangular pillars left to support the roof. These pillars may contain 50 to 60 per cent. of the coal in the seam, and the coal they contain cannot be extracted without the roof falling in, unless the galleries are packed with rock or sand. The filling of the voids with sand or rock either by hand or by flushing in with water is known as stowing, usually hydraulic stowing.

As a result of Mr. Treharne Rees' report the Government of India appointed a strong Committee known as the Coalfields Committee containing amongst its members the Chief Inspector of Mines, the Director, Geological Survey of India, the Mining Engineer to the Railway Board, nominees of the Indian Mining Association and the Indian Mining Federation, a representative of the Zamindars and of an Agency firm in Calcutta, the Committee being under the Chairmanship of the Commissioner of Chota Nagpur Division, with a Civilian Secretary (Mr. L. B. Burrows). In appointing this Committee the Government of India referred to Mr. Treharne Rees' report in the following terms :—

'The principal recommendations of Mr. Treharne Rees relate to the appointment of an inspecting and controlling authority for the supervision of the terms of leases, more efficient methods of coal extraction, including rotation of working and hydraulic stowage, the improvement of the conditions of colliery labour, the more economic use of power and more general employment of electricity, the improvement of methods of cokemaking, the introduction of coal mixing, the handling and despatch of coal, more extended employment of screening, and the possibilities of the manufacture of briquettes.'

The Coal Committee reported in 1920<sup>1</sup> and in their report recommended State control of the industry. The Coal Committee, visualising the possibility that the increase in India's annual output of coal from 5 million tons to 20 millions in 20 years would continue at the same rate, so that the output would be over 50 million tons by 1935, wrote (p. 19) :—

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<sup>1</sup> Report of the Coalfields Committee, pp. 1 to 199, Calcutta, (1919).

‘ Unless her resources are strictly conserved and the use of coal of lower grade substituted, wherever possible, for that of the better coking qualities, India may be faced at no very distant date with the loss of her metallurgical industries for want of coke.’

Actually, as already noticed, the expected expansion of output has not taken place ; none the less the passage quoted is true, and the danger has been much magnified by the passage of years.

The principal conclusions of the Coal Committee were (p. 30) :—

(1) That no improvement in the present wasteful methods can be expected without State interference, that such interference should take the form of a controlling authority with legal powers designed to ensure conservation and economic extraction, and that such authority should consist of a new Government department and a board sitting in Calcutta.

(2) That a steady and sufficient supply of wagons, with the requisite facilities for moving them, is the most urgent need of the industry.

(3) That sand-stowing should be made compulsory within certain limits and with provision for compensation, and that funds for the purpose should be raised by a cess and a duty of eight annas a ton on all coke and coal ; that the cess should be imposed as soon as possible, be collected by the railway companies on despatches, and be administered by the controlling authority.’

From both Mr. Treharne Rees’ report and that of the Coal Committee it appeared that the minimum amount of coal being left in the ground was 33 per cent., although to some it appeared that this figure was conservative and that the waste underground was greater. The question of wagon supply has long been rectified, but no action has been taken on recommendations (1) and (3) of the Coal Committee’s principal conclusions.

The Government of India did, however, issue in 1921 a letter to Local Governments, Mining Associations, Chambers of Commerce, and other interested bodies, in which the Government of India gave their provisional conclusions regarding the recommendations of the Coal Committee.

In their replies to this letter one or other of the various bodies consulted objected to almost every conclusion of the Government of India, and as a result the Government took no action on the report of the Coal Committee. I am betraying no secret when I mention that the principal reasons why the Government of India did not take action on the Coal Committee’s report were the facts that we did not know definitely the extent of the coal reserves of India of higher grade and therefore the seriousness of the admitted losses in working *vis-à-vis* the available reserves, nor did we know the extent to which it would be possible by methods of washing to improve the lower grade coals. These problems and the question of the reserves of sand available for stowing were therefore entrusted to the Geological Survey of India for examination. It was soon shown that no help was to be expected from processes of beneficiating

lower grade coals,<sup>1</sup> and that the supplies of sand available for sand-stowing were adequate.<sup>2</sup> Further, Sir Edwin Pascoe decided

Investigations of the Geological Survey of India.

to institute a resurvey of the Jharia and Raniganj coalfields and a re-examination of all the other fields, and in 1925 formed a special Coalfields Party of the Geological Survey of India under the superintendence of Dr. C. S. Fox. This was necessarily a long task, and has already led to the publication of 5 memoirs, one from the pen of Mr. E. R. Gee, and the remainder by Dr. Fox, with one memoir still to come. With the completion of Dr. Fox's memoir on 'The Lower Gondwana Coalfields of India',<sup>3</sup> the views of the Geological Survey of India on the available reserves of coal of all qualities in India were placed before the public. Dr. Fox's estimates were, of course, available to Government before this, and after the Government of India had rejected the coal restriction scheme proposed by the mining community in 1934, I was asked, as the then Director, Geological Survey of India, to prepare for publication a note on Indian coal reserves, in order to educate public opinion in India on the seriousness of the situation prior to the introduction by Government of measures of conservation, which, it is no secret, the Government of India have in preparation.

My note has been published as No. 54, *Bulletin of Industries and Labour*, issued in July 1935; and also, in order to ensure wider publicity, in the *Records of the Geological Survey of India*.<sup>4</sup>

The data assembled in this note were collected in 1933, and represent the position as it stood at the end of 1932.

The object of the publication of this note was to draw public attention to the alarming position that is rapidly being created in India owing to the methods of work in Indian coalfields, especially in Jharia. It was shown in this note, for instance, that if active measures were not undertaken to improve the methods of work in the Jharia field, this field would be exhausted in 33 years (from 1932) as a maximum, instead of lasting 80 years as was otherwise possible. My note has so far failed in its purpose in that two of the leading journals of Calcutta, the *Statesman* and *Capital*, each missed the main point. They both referred to my estimate that the 4,500 million tons of coal of good

<sup>1</sup> W. Randall, 'Froth Flotation of Indian Coals', *Rec. Geol. Surv. Ind.*, LVI, pp. 220-229, (1926).

<sup>2</sup> G. V. Hobson, 'Sand Supply in the Upper Damodar River', *Trans. Min. Geol. Inst. Ind.*, XXI, pp. 321-337, (1927). See also C. S. Fox, 'The Jharia Coalfield', *Mem. Geol. Surv. Ind.*, LXI, pp. 105-107, (1930); and E. R. Gee, 'The Geology and Coal Resources of the Raniganj Coalfield', *op. cit.*, LXI, pp. 298-302, (1932).

<sup>3</sup> *Op. cit.*, LIX, (1934).

<sup>4</sup> 'India's Coal Resources (Being a Note on the Reserves available in India of Good Quality Coal. Including Coking Coal)', *Rec. Geol. Surv. Ind.*, LXIX, pp. 336-352, (1935).



quality would be exhausted in 100 years if we allow for a recovery of 50 per cent. only, and an average annual production of only 22,500,000 tons; or in 75 years, if the future average annual extraction be 30 million tons. But neither journal mentions the much more serious fact that the 1,700 million tons of coking coal so essential to the existence of the iron and steel industry will last on the average only 33 years from 1932, at the present rate of extraction, and with a recovery of 50 per cent.; but that such coal would last 80 years if, with sand-stowing, the extraction were improved to 80 per cent. It is because of my failure in the note mentioned to impress the public with the seriousness of the situation that I have decided to utilise the present occasion again to discuss coal reserves.

It is necessary here to give only a résumé of my note. The data in it are based largely on Dr. Fox's memoir on 'The Lower Gondwana Coal-fields of India' already referred to.

According to Dr. Fox, the quantities of coal of all qualities in the Gondwana coalfields, which are responsible for 98 per cent. of India's coal output, are 60,000 million tons; of which 25,000 million tons occur in the Damodar Valley coalfields, namely the Raniganj, Jharia, Bokaro, and Karanpura coalfields. If we restrict the totals to include only those seams over 4 feet thick and averaging 20 per cent. of ash (not exceeding 25 per cent. ash on a moisture-free basis) and lying within 1,000 feet of the surface, then, according to Dr. Fox, these estimates fall to 20,000 million tons, of which 10,000 tons lie in the Damodar Valley coalfields. Dr. Fox next forms estimates of coal of good quality, taking into account only seams of upwards of 4

feet in thickness and with ash not exceeding 16 per cent. on a moisture-free basis.

Because of the better grade of coal considered, he takes into account coal down to a depth of 2,000 feet. This leads to a total of 5,000 million tons, of which 3,150 million tons lie in the Jharia and Raniganj fields. This 5,000 million tons can be split up into—

3,500 million tons at 0 to 1,000 feet from the surface.

1,500 „ „ „ 1,000 to 2,000 „ „ „ „

Of this, the 3,500 million tons is included in Dr. Fox's total of 20,000 million tons.

After considering carefully Dr. Fox's estimates for the various fields and modifying his figures for the Bokaro and Karanpura fields, I find we can still reckon on a total of 4,500 million tons of coal of good quality.

I have already brought to your notice that the earlier anticipations of expansion of the Indian coal industry have not been realised, and that the industry has been practically stationary from 1919 to 1934.

If we assume no further growth in the industry and an average annual consumption of 22,500,000 tons, the 4,500 million tons referred to above would last for 200 years, if 100 per cent. extraction were secured. Judging, however, from the data given in Dr. Fox's memoir, unless something effective is done to cause an alteration in the system of working coal in India, not more than 50 per cent. and probably less of this coal will, in fact, be brought to the surface. This means that without allowing for any growth in the coal industry of India, reserves of good quality coal will be exhausted in 100 years. This is a position which the nation cannot contemplate with equanimity.<sup>1</sup>

If, however, we assume that when the present world depression ceases India will resume her industrial progress, we must, even after allowing for the increasing competition of water power, oil fuel and petrol as sources of energy, assume a substantial growth in India's consumption of coal. On an average consumption of coal at the rate of 30 million tons annually, 4,500 million tons of coal would last 150 years with a 100 per cent. extraction, 75 years if only 50 per cent. of the coal be won.

In these last two paragraphs I show the position that would arise if all demands were met from coal of good quality only. This, of course, will not happen; but, in practice, market and technical considerations cause by far the greater portion of India's requirements to be met from her supplies of coal of good quality. If we could assume an average supply in the future of 20 per cent. of our requirements from second-class coals, and 80 per cent. from first-class coals, the saving in first-class coal would prolong the periods mentioned in the previous two paragraphs by 25 per cent. Should average higher prices for coal prevail in the future than in recent years, then the proportion of second-class coal worked would increase, with a corresponding prolongation of the periods mentioned in the two previous paragraphs.

As is well known, India is the possessor of enormous supplies of iron-ore of the very highest quality, estimated for the iron-ore fields of Bihar and Orissa alone as of the order of 3,000 million tons. (There are also vast quantities of iron-ore in other parts of India.) To smelt this ore by methods at present in vogue, the use of high-quality metallurgical coke is necessary, in the proportion, stated roughly in terms of original coal, of 1 ton of coal to 1 ton of iron-ore smelted. This means that if India is to take the position in the world as a smelter of iron and steel that appears justified by her reserves of high grade iron-ore, we should be able to see in India available for the use of this industry not less than 3,000 million tons of good quality coal suitable for

<sup>1</sup> This is the figure seized upon by the *Statesman* and *Capital* and regarded with comparative placency instead of the much more alarming figure of coking coal to be noticed later.

the manufacture of metallurgical coke, that is to say, a greater amount of good coking coal than the total of all the good quality coal—coking and non-coking—that will be extracted if present methods of work are continued.

It is important, therefore, to see what proportion of the 4,500 million tons of coal of good quality referred to above can be regarded as suitable for the preparation of metallurgical coke. Dr. Fox gives figures totalling to 1,500 million tons in the Giridih, Raniganj, Jharia, and Bokaro coalfields. This total, in my opinion, could be increased to 1,694 million tons or say 1,700 million tons, as at the end of 1932. The following table shows the reserves of good quality coking and non-coking coal in India at the end of 1932 :—

## Reserves of good quality coking and non-coking coal in India at the end of 1932.

(In millions of tons.)

Coalfields.	Authority.	Coking coal of superior quality.		Non-coking coal of superior quality.		Total coking and non-coking coal.
		0-1,000 feet.	1,000-2,000 feet.	0-1,000 feet.	1,000-2,000 feet.	
Girdih	Saïse	38	168	..	..	38
Raniganj	Geo	73	163	953	607	1,801
Jharia	Fox	737	245	298	52	1,250
Bokaro	Fernor and Whitworth	270	..	7	..	222
		1,118	576	1,258	659	
TOTAL	...	1,694	1,694	1,917		3,611
Karapura* (N. and S.)	Spencer	..	..	Non-coking coal of superior quality. 550*		550
Hutar, Jholla, Burhar	Fox	..	..			50
Kurasia, Jhimili, etc.	..	..	..			30
Talcher to Korba	..	..	..			200
Kanhan-Pench	..	..	..			30
Ballarpur-Singareni	..	..	..			50
TOTAL	...	..	..	910		910
Total coking and non-coking coal	...	1,694	1,694	2,827		4,521

\* Of which 350 million tons assumed to be semi-coking and 200 million tons non-coking.

It will be seen that the total quantity of coking coal suitable for the manufacture of metallurgical coke at the end of 1932 may be taken as follows :—

At depths of 0 to 1,000 feet .. ..	1,118 million tons.
At depths of 1,000 to 2,000 feet .. ..	576 „ „
<b>TOTAL ..</b>	<b>1,694 million tons.</b>

No doubt small additional quantities of good coking coal will be discovered in the future, possibly, for example, in West Bokaro ; but the probable amounts are not likely seriously to alter the problem, and in the total of 1,694 million tons given above, say, 1,700 million tons, we have almost certainly arrived at a figure which is not very far from the truth.

In addition, technical research may show that by blending with strongly coking coals, coals not at present regarded as coking coals, such as the semi-coking coals of Karanpura, may become available to the iron and steel industry. But no allowance can be made for such possibilities, which, after all, are only possibilities.

According to our present knowledge, the best coking coals of India are in the Giridih and Jharia fields. A proportion of the Giridih coal, 9 million tons according to Dr. Fox, is of extra special quality due to its very low phosphorus content. Such coal is suitable for very special metallurgical purposes, such as in the manufacture of ferro-manganese for export, for such alloy must not contain more than a definite amount of phosphorus if it is to compete in the world's markets. This coal is, in fact, the only known coal in India suitable for such manufacture. The Tata Iron and Steel Company manufactures ferro-manganese for its own purposes, but, as this alloy is not for export, the company does not find it necessary to work to the same stringent limits in phosphorus contents as would otherwise be necessary, and, therefore, does not make a claim upon the special coal from Giridih. There is, at the present time, in fact, no existing metallurgical industry in India that demands this coal, and this very special coal is instead being extracted and consumed for railway purposes for which so much other coal is suitable.

Apart from Giridih, which is only a small field, the best coking coal in India is in the Bhagaband and Jialgara stages of the Jharia field. The total amount of such coal, according to Dr. Fox's estimate, is 737 million tons down to 1,000 feet from the surface, with an additional amount of 163 million tons between 1,000 and 2,000 feet. Work at present is practically confined to the upper thousand feet. According to Dr. Fox, with the present methods of work, not more than 50 per cent. of this coal will be won, and the remainder will be lost due to

collapses, fires, and floods. The total annual extraction from Jharia during the past 10 years has been about  $10\frac{1}{4}$  million tons annually. Of this, according to Dr. Fox, from 8 to 10 million tons come yearly from the Bhagaband and Jialgara stages in which all the best coking coal is concentrated. Taking an average figure of 9 million tons, we get the life of the coking coals of the Jharia field down to 1,000 feet from the surface as—

$$\frac{737}{2} \times \frac{1}{9} = 41 \text{ years}$$

if present methods of mining be not radically improved. Forty-one years is, however, in excess of the truth. According to Mr. R. R. Simpson in 1929 <sup>1</sup>—

‘It is estimated that at the present time there are not less than 120 million tons of first class coal standing in pillars which it is impossible to extract by the ordinary method of mining. Partly included in this figure, but largely in addition, there is the great quantity (some hundreds of millions of tons) of coal which cannot be worked by the ordinary methods owing to the necessity for providing underground support for rivers, roads and the network of railways which covers the coalfields.’

Allowing for the extraction since 1929, namely in 1930, 1931 and 1932, of another 27 million tons from these two stages in the Jharia field, we can estimate that at a minimum another 30 million tons of coal has been left standing in pillars, so that allowing for such pillar extraction as has taken place, and pillared coal lost in fires and collapses, and no longer included in the calculated reserves, we can safely place the present quantity of coal standing in pillars at not less than 137 million tons. Nearly 100 per cent. of this will be lost unless some form of stowing is resorted to. This means that, without stowing, our reserves are only  $737 - 137 = 600$  million tons. This quantity corresponds to a life for the Jharia field, if present practice be not revised, of only—

$$\frac{600}{2} \times \frac{1}{9} = 33 \text{ years}^2$$

a period so trivial as to be equalled by the period of service of, say, a Government servant.

This figure, though not identical with, is of the same order of magnitude as other gloomy predictions of recent years.

<sup>1</sup> ‘The future of the Jharia Coalfield’, *Trans. Min. Geol. Inst. Ind.*, Vol. XXIV, page 111. Mr. Barraclough’s figures at the end of 1927 was 131 million tons.

<sup>2</sup> Mr. N. Barraclough’s estimate is a life of 68 years from 1927 for the Jharia field based on certain calculations. But he goes on to show that this is an exceedingly optimistic figure unless sand-stowing be adopted, *Rec. Geol. Surv. Ind.*, LXII, p. 382. Also see Mr. Barraclough’s paper ‘Coal lost by Fires and Collapses in Indian Coal Mines’, *Rec. Geol. Surv. Ind.*, LXII, pp. 385–389, (1928).

An extraction of 100 per cent. of 737 million tons at 9 million tons a year gives an 82-year life for the coking coals of the Jharia field. A 50 per cent. extraction gives a 33-year life. These are the limits. In addition there is the coal between 1,000 and 2,000 feet, namely 163 million tons of coking coal. At 100 per cent. extraction, this adds 18 years to the life, making a total of 100 years. At 50 per cent. extraction, for the coal between 0 to 1,000 feet, the coal between 1,000 and 2,000 feet cannot be taken as adding anything to the reserves, because with a 50 per cent. extraction only of the coals above 1,000 feet, the companies and the field would be involved in such losses due to collapses, fires and floods that much of the deeper coals will be rendered either physically or economically unworkable.

Without sand-stowing and with a *continuance of only the present average rate of extraction*, we can, therefore, put the life of the Jharia field at some 33 years from the end of 1932, now already reduced to 30 years. With stowing it will be somewhere between 33 and 100 years according to the extent to which this process is adopted. If, as a result of sand-stowing, the extraction could be improved from 50 per cent. to 80 per cent., the life of the field would be 80 years, that is, more than double what it would be otherwise.

As it is important to ascertain the extent to which India's reserves of coking coal are being used for one of the principal purposes for which they have been fitted by Nature, I took the figures of production for the 11 years, 1922 to 1932, and estimated that the amount of good quality coking coal removed annually from the four fields in question was :—

		Tons.
Giridih (at 100 per cent. of output)	..	735,000
Raniganj (at 30 per cent. of output)	..	1,870,000
Jharia (at 85 per cent. of output)	..	8,753,000
Bokaro (at 100 per cent. of output)	..	1,595,000
<b>TOTAL</b>	<b>..</b>	<b>12,953,000</b>

By correspondence with known producers, I obtained the amount of coal used for the preparation of hard coke during 1931 and 1932, and the amount of coke manufactured. The figures are :—

		1931. Tons.	1932. Tons.
Total coke manufactured	..	1,309,308	1,214,526
Coal used	..	1,754,469	1,635,972
Percentage recovery	..	74.74	74.72

		1931	1932
		Tons.	Tons.
Source of coal used—			
Jharia field	.. ..	1,687,681	1,585,733
Giridih field	.. ..	33,209	32,724
Bokaro field	.. ..	21,123	4,637
Raniganj field	.. ..	12,456	12,878
TOTAL	..	1,754,469	1,635,972
Amount used by the three iron and steel smelting companies..		1,341,055	1,322,969
Amount used by others ..		413,414	313,003

From this statement we see that almost the whole of the hard coke of India is made from Jharia coal. The only exceptions are the use of Giridih coal in the coke ovens at Giridih by the East Indian Railway and the use by the Indian Iron and Steel Company of a small quantity of Bokaro and Raniganj coal (the Chanch seam) and a trivial quantity of Giridih coal in blends with Jharia coal.

The ratio that these figures of consumption of coking coal bear to the production of the respective fields in coking coal is shown below :—

		1931.		1932.	
		Total pro- duction of coking coal.	Consumed in coke making.	Total pro- duction of coking coal.	Consumed in coke making.
		Tons.	Tons.	Tons.	Tons.
Giridih	..	713,133	33,209	583,243	32,724
Raniganj	..	1,960,000	12,456	1,925,000	12,878
Jharia	..	8,292,000	1,687,681	7,269,000	158,573
Bokaro	..	1,656,597	21,123	1,348,973	4,637
TOTAL	..	12,621,730	1,754,469	11,126,216	1,635,972

From these figures it is seen that of the total amount of coal won in India in 1931 and 1932 suitable for the manufacture of metallurgical coke, only 13.9 and 14.7 per cent. respectively were used in the manufacture of hard coke. If we adopt Dr. Fox's view that without stowing only 50 per cent. of the coal will be won, then the percentage of coal used in the manufacture of hard coke falls to 6.9 and 7.3 per cent. of the coal extracted, immobilised and wasted underground.

From these figures we also see that with a 50 per cent. loss, nearly 25 million tons in 1931 and 22 million tons in 1932 of good coking coal were consumed, immobilised or wasted underground, with the supply for the manufacture of hard coke of only 1½ million tons in 1931 and 1½ million tons in 1932, the balance being put to other uses.

These figures also show the overwhelming extent to which the manufacturers of hard coke rely upon the Jharia



coalfield. Of the coal used in the manufacture of hard coke in 1931 and 1932, 96·2 per cent. and 96·8 per cent. respectively were derived from the Jharia field. This must be taken as an index of the superiority of the Jharia coal for this purpose over the other coals, except the small Giridih field. The Raniganj coal has in the main to be mixed with Jharia coal, and the Bokaro coal is higher in ash contents.

Except in so far as the existing iron and steel companies have secured and reserved to themselves adequate portions of the Jharia coalfield, the Jharia coking coals will be exhausted at the end of the period of 33 years, estimated above, unless there is improvement in mining practice; the iron and steel industry will then have to rely upon Bokaro coal and admixtures of Bokaro coal with such Raniganj coals as are still available, and perhaps with semi-coking coals from Karanpura. I have made this qualifying remark with reference to Raniganj coals, because the major portion of the coking coal of this field is in the Dishergarh seam, which is the most valuable steam coal in India and is in great demand for railway purposes and the bunkering of ships. The figures of 33 years given above are based on the premise that extraction continues at the same rate and under the same conditions as before. I understand, however, that the existing iron and steel companies have secured control of substantial sections of the Jharia coalfield. Such companies will doubtless in their own interests use improved methods of work and also extract their coal only at the rate necessary for their own operations. As a result the life of these portions of the field will be prolonged, whilst that of the remainder will be less than 33 years, unless the rate of annual production is reduced, or improved methods of work introduced.

It will be observed that I have reduced Dr. Fox's estimate of 5,000 million tons of good quality coal, both coking and non-coking, to 4,500 million tons, but have increased his estimate of 1,500 million tons of coking coal to 1,700 million tons. Dr. Fox's comment on this, made in his recent Presidential Address to the Mining and Geological Institute of India, is that I am being unduly optimistic, and that the position is very much worse.

Even if my figure of 1,700 million tons is correct, I agree with Dr. Fox that the position is actually much worse than can be deduced from these figures. The Jharia coalfield, as we all know, is now one vast honeycomb in the best seams, and even with stowing much coal that could otherwise have been recovered will be lost due to subsidence and fire. According to one report in the press, the strict accuracy of which I cannot vouch for, out of 133 working coal mines in Jharia about 42 are on fire, a statement that presumably means have portions on fire.

A further reason why the foregoing figures may prove to be unduly optimistic is, I regret to say, the unexpected effects of the operations of the Operations of Coal Grading Board. Coal Grading Board. The Board was instituted for the purpose of helping the Bengal coal trade to recover lost export markets by ensuring that coal of uniformly high quality was offered for export. The scheme has been as successful as was possible, but it has had an unfortunate and unexpected repercussion due to two causes. The first is that the Indian Coal Grading Board adopted a method of grading coal different from that intended by the Coal Grading Board Act, 1935,<sup>1</sup> by basing their classification on analyses on a moisture-free basis. This is a more favourable treatment than the Act appears to have intended and must allot to many coals a considerably higher calorific value than the coal as used possesses, and consequently must, in many cases, allot a coal to a higher grade than would otherwise be the case, a matter to which I have already drawn attention.<sup>2</sup> The second cause is that the operations of the Indian Coal Grading Board have been extended far beyond the intended scope of the Act, namely to all coal of quality produced in the Damodar Valley coalfields instead of being restricted to coal actually shipped. This result was perhaps inevitable once it was decided to grade the coal seams themselves, instead of issuing certificates for cargoes as actually shipped. As a result thereof every coal owner, whether he was an exporter of coal or not, asked to have his seams graded. In practice this has meant not the grading of a seam as a whole, but section by section, so that instead of a seam being, say, first-grade as a whole, a portion of it was found to be of selected grade.

With the competition of the last few years and the continuous fall in the price of coal, the market has gradually concentrated on selected grade coal, which is now being sold at what must be regarded as rubbish prices. If a seam say 10 feet thick and on an average of first-grade contains a thickness of 4 feet of selected grade coal, this latter only may be worked, with the danger that the remaining 6 feet will never be worked at all. Consequently in addition to the recovery of say only 50 per cent. of those parts of seams that are worked, we have to contemplate the complete loss of the whole of the remainder. In the example given, the recovery on the whole seam would be only 20 per cent.

What are the remedies for this deplorable state of affairs in the Indian coal industry? Much has Remedies. been written on this point, and I myself have given much thought thereto. I do not propose to enter

<sup>1</sup> See para. 24 of the Act.

<sup>2</sup> See *Rec. Geol. Surv. Ind.*, LXIII, pp. 190, 191, (1930).

into a discussion of all the possibilities, but only to state what appear to me to be the practicable and suitable remedies.

1. The first is that the lessors must be helped, in fact compelled, to look after their own interests, so that lessees are not allowed to work in such a manner that much of the coal that could be won is left underground. This means that the principles of good workmanship must be defined, and a Conservation Staff appointed to see that such methods are followed. As the mineral owners are not, as a rule, likely, for various reasons, to do this for themselves, it means Government intervention. The ideal method would be the formation of a new Government Department, a Coal Conservation Department [this is practically conclusion (1) of the Coalfields Committee]; but Government may find it easier to entrust the duties to the existing Mines Department.

2. Such improved methods will incidentally entail the extensive introduction of some method of stowing the voids, usually referred to as hydraulic stowing or sand-stowing. In most cases this cannot be done at present market prices, and the general opinion appears to be that sand-stowing will add on the average about one rupee per ton to the cost of mining the coal. The meaning of this is that with coal of the best quality now selling at Rs. 3 or under per ton, so that many companies can only just make a profit whilst many others cannot, even when making no provision for the extraction of pillar coal, that Rs. 4 per ton must be regarded as the minimum price per ton that coal of the best quality must fetch at the mines if the coal is to be worked in a workmanlike manner. The introduction of methods of conservation will in itself probably produce this necessary rise in price because it is obvious that, once improved methods are enforced, producers will not be able in many cases to sell at the present prices and will be compelled to withdraw from the market until remunerative prices are obtained.

3. There should be a change in the methods of grading coal so that certificates are issued only for coal as actually exported. This will entail the sampling and analysis of cargoes as shipped, the cost of which will be trivial in proportion to the value of the cargo. Such a method has long been in use for other minerals, *e.g.* manganese-ore, and must obviously be more satisfactory to the buyer. For with the present method of issuing certificates for seams or sections of seams in the ground, there is no guarantee that the purchaser receives what he has paid for. The purchaser of coal is really buying heat units, if the coal is to be used as fuel only, the purpose for which the major portion of the Indian coal is sold. As a purchaser I should

certainly wish to know the number of calories or heat units to be yielded by the coal purchased, and should therefore wish to buy on analysis; in fact I should prefer to buy on a sliding scale with a price based on a certain number of calories, and a certain ash and moisture percentage. I should expect to pay a bonus for calories in excess and for ash and moisture below the standard figure, and, on the other hand, to exact a penalty for calories in deficit and ash and moisture in excess. In fact, in my opinion, one of the necessary improvements in the coal trade is that coal should be sold on analysis of the coal as actually loaded or delivered with bonuses or penalties according to variations from the analysis agreed upon for the quoted price. Such a change would rapidly remove the disastrous effect of the present grading scheme in directing preferential attention to selected sections of seams, with resultant danger of complete loss of the remainder of the coal.

It will be asked whether railway traffic and industries generally can stand a minimum price of Rs. 4 per ton for coal that the welfare of the coal industry requires. One answer to this question is that if the coal industry does not receive a fair price now, the premature exhaustion of many valuable seams will inevitably lead to very much higher prices eventually, with resultant great hardship to Indian industries. That the price of the coal of Bengal, Bihar and Orissa is at present unduly low in proportion to railway freights will be seen when I mention a figure recently given to me of coal offered at Rs. 2.8 a ton in the Damodar Valley costing Rs. 12.8 delivered at Satna in Central India, so that the freight on one ton of coal to Satna would have been equivalent to the cost of 4 tons of coal. As coal is the motive power for railway traffic, this is equivalent to saying that to the public it costs 4 tons of coal to move one ton. Further when one recalls the price that is eventually paid for Bengal coal upcountry and at Bombay, it is evident that an increase in price of Re. 1 would be only a small proportionate increase, and that its adverse effect in competition with coal imported from abroad could be neutralised by a corresponding reduction in long distance railway or shipping freights. The fuel that is the motive power of railways appears to have some claim for special treatment, for without coal there would have been no railways.

I have suggested above that the Damodar Valley coalfields require a minimum price of Rs. 4 per ton for first-class coal. What this price would mean with reference to India's ability to pay can perhaps be judged from the figures shown in the following table in which the price is given in the final year of each of the periods represented in the table on page 5, that is to say, every 5 years :—

*Production of Coal from India, Jharia and Raniganj, every 5 years from 1903 to 1933.*

	Total production. Tons.	Jharia.		Raniganj.		Jharia + Raniganj. Per cent. of total.	All-India value per ton. Rupees.
		Tons.	Per cent. of total.	Tons.	Per cent. of total.		
1903	..	7,438,386	33.53	3,066,720	41.23	74.76	2 10 0
1908	..	12,769,635	50.58	4,221,781	33.06	83.64	3 15 0
1913	..	16,208,009	53.11	5,327,248	32.57	85.98	3 8 0
1918	..	20,722,493	52.85	6,368,519	30.74	83.59	4 6 0
1923	..	19,656,883	52.63	5,557,424	28.28	80.91	7 7 0
1928	..	22,542,872	47.31	6,460,490	28.66	75.97	3 15 0
1933	..	19,789,163	40.50	6,265,703	31.66	72.16	3 1 6
1934	..	22,057,447	41.06	6,795,838	30.81	71.87	2 13 9

From this table you will see that the average value at pit's mouth of all-Indian coal increased steadily from Rs. 2-10 in 1903 to Rs. 4-6 in 1918, and Rs. 7-7 in 1923, falling to Rs. 3-1-6 in 1933, and finally to 2-13-9 in 1934. By 1934, prices had in fact fallen to the price of 31 years ago before the cost of so many items in the cost of production had increased ; and it seems quite evident that in 1934 a fair price to coal must be greater than that of 1903. Other columns of this table show the total production of coal in India for the selected years and also the production of Raniganj and Jharia coalfields separately, from which it will be seen that the production of these two fields rose from nearly 75 per cent. of the total in 1903 to nearly 86 per cent. in 1913, and has since fallen steadily to 72 per cent. Even with this reduced percentage the output of these two fields forms such a large proportion of the total that it is quite evident that the premature exhaustion of either of these fields will be a major calamity to the Indian coal mining industry. It is to be remembered that unless something is done to check present trends, the Jharia coalfield, which during the period reviewed has produced from 33 to 53 per cent. of the total Indian output, will be finished in less than 30 years, except in so far as smelting companies have secured portions of this field for their own purposes, in which case the remainder of the field will be exhausted still quicker.

Whilst recognising that the coal industry requires a higher price for coal in the interests not only of the industry, but also of the welfare of India as a whole, my personal anxiety has been that this increased price should not be obtained by the industry except in return for the *quid pro quo* of improved methods of work.

### III. CONCLUSION.

The Government of India are understood to have in hand a scheme for enforcing the conservation of coal in India. My plea to the coal industry is that when this scheme is made public, they do not proceed to decry every part of the scheme that affects them personally, as was done in 1922, but that instead they welcome the scheme as being in the best interests of all in the long run, and that they even invite Government to take a more effective line, if they consider that Government's proposals are not sufficiently far-reaching.

I hope the Society will consider that I have done well in making use of this occasion to draw public attention once more to this very serious question of the certain premature exhaustion of some of India's most valuable coal reserves if nothing effective is done to introduce improved methods of work in the Indian coalfields ; for in a relatively few years India will be faced with what will then be regarded as a national disaster of the first magnitude.

This evening my period of service as your President comes to an end. I am conscious that during my term of office I have not succeeded in effecting all the improvements I should have liked to effect: but this must be the experience of every retiring President. So I take this opportunity of thanking the Council and members of the Society for the encouraging support they have given during this very interesting period, which has included the 150th anniversary celebrations. And, finally, I hand over this Chair to my distinguished successor H.E. Sir John Anderson.

L. L. FERMOR.

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ASIATIC SOCIETY OF BENGAL, 1936.

*Elected and announced in the Annual Meeting,  
3rd February, 1936.*

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## EXHIBITION ANNUAL MEETING.

### LIST OF EXHIBITS SHOWN AFTER THE ANNUAL MEETING OF THE ASIATIC SOCIETY OF BENGAL, ON THE 3RD FEBRUARY 1936.

#### 1. A. F. M. ABDUL ALI.

##### *Miscellaneous Historical Documents.*

- (1) List of Fees of the Chaplaincy of Fort William.  
(Pub. O.C., 26 Oct., 1761, No. 3.)
- (2) Copy of letter from Lieut.-Col. Archibald Campbell and Major Henry Watson submitting proposals relative to the construction of docks, etc.  
(Pub. Con., 27 Mar., 1770, Nos. 2(a), 3(a) and 4(a).)
- (3) Letter from Lieut.-Col. J. Fortnom, Chief Engineer, submitting the plans of Fort William.  
(Pub. Con., 24 Mar., 1775, No. 1.)
- (4) Draft of a letter to Monsr. Chevalier, acquainting him with the provisions made for the subsistence of the Frenchmen at Chandernagore and for the disposal of the captured property, and requiring him to come to Calcutta, or to depart for Europe.  
(Pub. Con., 2 Sep., 1778, No. 11.)
- (5) Letter from Messrs. T. Motte and E. Maxwell, Superintendents of Police, suggesting measures for reducing the high price of provisions, and enclosing a plan for regulating the wages of menial servants.  
(Pub. Con., 3 Apr., 1786, Nos. 25-26.)
- (6) Proceedings of the Committee for enquiring into the causes of the scarcity of silver coin.  
(Pub. Con., 6 Dec., 1787, No. 28.)
- (7) Copy of the proceedings of the vestry of St. John's regarding leasing the court-house to the Company.  
(Pub. Con., 9 Feb., 1795, No. 2.)
- (8) Patna Massacre and Grant of the Diwani to E.I. Company.  
(Photographic copies.)
- (9) Petition of the Greek inhabitants of Calcutta requesting permission to erect a chapel.  
(Pub. Con., 11 Apr., 1774, No. 4.)
- (10) Copy of Proposals of Agreement of Nubkessen and Gocul Gosaul to farm the Calcutta Town and Lands.  
(Pub. Con., 20 Aug., 1767, No. 1.)
- (11) Letter from the Rev. J. Z. Kiernander, asking the Board to exempt the Protestant Mission buildings and burial ground from the payment of rent and taxes.  
(Pub. Con., 1 Sep., 1777, No. 15.)

(12) Copy of a letter from the Commissioner of Police, transmitting a complete estimate of the value of all the shops, lands, houses, tenements and hereditaments in the town of Calcutta, as well as the assessment of a tax for the year 1781, intimating that for the present the full tax permitted by the ordinance must be levied, and requesting the Board to signify their approval of the assessment in writing.

(Pub. Con., 2 July, 1781, No. 1.)

(13) Letter from the Commissioners of Police, explaining why no tax had been previously levied on the houses of the Chowringhee quarter of Calcutta.

(Pub. Con., 4 Apr., 1787, No. 19.)

(14) Copy of a petition from some native inhabitants of Calcutta setting forth their grievances against the continuance of the assessment, and praying that Mr. Meyer may be authorized to submit a report on the allegations and that their grievances may be redressed.

(Pub. Con., 7 May, 1790, No. 6.)

(15) Petition from Ramgopal Babu and Giridhar Babu, on behalf of the native inhabitants of Calcutta, representing the hardships of the poor people on account of the rigorous enforcement of the collection of house tax in Calcutta, and soliciting redress.

(Pub. Con., 24 Aug., 1792, No. 17.)

## 2. ARCHÆOLOGICAL SURVEY OF INDIA.

### (1) *Terracottas from a big mound near Ghosi, Dist. Azamgarh, U.P.*

Bricks of Gupta and Mauryan period and coins, beads, etc. were also found in the mound which is reported to be fairly extensive and high. Ghosi, according to the Padma Purāṇa, was an important centre of pilgrimage. The height of the mound (which is reported to be from 40-50 feet) and its extensive area (about 117 bighas) indicate that it must be a large settlement continued over a considerable period. The terracottas were found in a confused and disturbed condition. Perhaps a fuller and most systematic exploration of the site might yield antiquities of a much earlier period.

### (2) *Navagrāma grant of the Mahārāja Hastin (G.E. [1]98) from Nagod State, C.I.*

The plate consists of the left half of the first of two plates forming the complete grant. The characters belong to the northern class of alphabets. The language is Sanskrit and the record is in prose. The plate records the grant of a village called Navagrāma in the *rāshtra* of the Pulinda chief (apparently a feudatory of the *nripati-parivrajakas*), by the Mahārāja Hastin in the year 98 (increased by 100). The donees were brahmins of the Parāśara-gōtra and Mādhyandina-sākhā (of the white Yajurveda). The year 198 of the present plate must be considered to be the last date of Hastin whose successor Samkshobha issued the Betul grant in the year 199. The earliest known date of Hastin being 156, the year of his Khoh copper-plate, he must have enjoyed a long reign of over 42 years. The known dates of Hastin (156, 163, 191, and 198) and Samkshobha (199, 209) are to be referred to the Gupta era. The mention of MAHĀSVAYUJA-SAMVATSARA with the Gupta year 198 enables us to fix the date of the present record within a narrow compass. The year 198

G.E. commenced on 9th March, 517 A.D., and the Mahāśvayujasamvatsara ended on or about the 23rd April, 517 A.D., and the present record must be dated within these limits. The missing month may be supplied as Chaitra (in which case the fortnight must be the bright fortnight) or Vaiśākha.

### (3) *Sculptures from Sārṇāth.*

(i) Sandstone torso of a Yakṣī? or Chauri-bearer assigned to the Śuṅga times. Note crisp and close-fitting waist-girdle and atrophied waist which reminds one of Bharhut.

(ii) Statuette representing the Buddha. The figure displays all the serenity and deep calmness that characterize the best in the Sārṇāth type of Buddhas. For sheer æsthetic appeal and overpowering divine inspiration the specimen stands unrivalled. 5th or 6th century A.D.

(iii) The hand of Buddha indicating *abhaya*, 'protection'. Interestingly enough it is painted red and the fingers display a delicacy and slenderness that bespeak the Buddha's universal compassion. 5th or 6th century A.D.

(iv) Bust of a female figure. Facial expression which is divine and indicative of composure points to the figure being that of a goddess. The figure reminds one of a figure of Tārā also from Sārṇāth in the Indian Museum which it resembles closely and may be considered to date like the latter from the 8th century A.D.

### (4) *Inscribed Buddhist bronzes from the old Buddhist Vihāras at Negapatam, South India.*

Here are 13 such inscribed bronzes representing the Buddha, out of a huge find of about 300. From a study of the inscriptions on them their dates may be said to range from the 11th to the 15th centuries A.D. Buddhism was really flourishing at Negapatam as late as the 15th century A.D. Buddhists from Sumatra and Java settled down at Negapatam in the time of the Śailendras (9th century A.D.) and their religion was patronized by the Imperial Cholas (875-1250 A.D.).

The inscriptions on the bronzes exhibited can be translated as follows :—

1. (6931) *Uḍayāṇḍālga.*

'May He (the Lord) live and rule!'

Here we have a prayer that the Buddha should live and that his Dharma must prosper.

2. (6932) *Sokkar.*

'(The Lord, who is) Light.'

There is a reference here to the Buddha as the Supreme Light.

3. (6934) *Tiruvaraṅga Nāyakar.*

'The lay follower, Tiruvaraṅga.'

Here we have the donor's name who made the votive offering.

4. (6891) *Śāriyipiḷḷai Nāyakar.*

'The lay follower, Śāriyipiḷḷai.'

Śāriyipiḷḷai is the Tamil equivalent for Śāriputra. The donor is evidently named after Śāriputra.

5. (6908) *Āḷudai piḷḷai.*

'[The lay follower], Āḷudai piḷḷai.'

6. (6910) *Sanḱāṇḍāl Nāyakar.*

'The lay follower, Sanḱāṇḍāl.'

7. (6913) *Naṅgai piḷḷai Nāyakar.*  
'The lay follower, Naṅgai Pillai.'  
Naṅgai Pillai would mean 'son of the lady'.
8. (6916) *Ānandar Devar.*  
'The Deva Ānanda.'  
Here there is a reference to an Ānanda, some Buddhist Bhikshu, or head of the *vihāra*, who is called a Deva.
9. (Y) *Svasti Śrī Tiruvīnai tulaḷ Periyamānālar.*  
'Hail, prosperity. The great bhikshu-devotee, the remover of sins and fate's workings.'  
The donor is evidently a bhikshu of eminence.
10. (6893) *Pālan malai yati arai Devar.*  
'The Deva (bhikshu), the king of ascetics, from Pālanmalai.'  
The donor is a great bhikshu hailing from a hill called Pālanmalai, the whereabouts of which are unknown.
11. (6902) *Mulai Śrama . . .*  
An incomplete inscription which speaks of a *Śramaṇa*, probably a donor.
12. (6915) *Aṟiyarar Nāyakar.*  
'The lay follower (H)arihara.'  
The donor is one Harihara (a Hindu name) who had evidently become a convert to Buddhism.
13. (6940) *Tillai.*  
This may be the name of a person. But usually by Tillai one will understand Chidambaram, a place of Hindu pilgrimage in S. India, the seat of Natarāja.

### 3. K. BISWAS.

*Some of the common plants of Bhutan including the recent collection of His Excellency Sir John Anderson, P.C., G.C.B., G.C.I.E., Governor of Bengal.*

Turner (1783) and Griffith (1838) are the two earliest collectors of Bhutan plants. Cooper of Edinburgh made some collections during 1914-1915. Collection of what was formerly within Bhutan territory up to Sinchula was made by me. But a substantial collection from the border of Western Bhutan up to an elevation of about 18,000 ft. has been made during last October by H.E. Sir John Anderson. The plants and illustrations exhibited are some of the species from these collections representing more or less different altitudinal zones.

### 4. L. BOGDANOV.

*A Persian (Isfahan) stencilled wall-hanging (qalamkār) said to represent the poet Ḥāfiẓ. Size: 6 feet, 3 inches by 11 feet, 1 inch.*

The poet is seen in the picture sitting on a chair, whilst two attendants, one male and one female, are holding behind him and his companion a curtain intended, obviously, to screen him from indiscreet eyes. A third attendant is sitting on the floor at the poet's feet holding a vessel with wine. In the background a hill with trees and buildings is roughly delineated. In the foreground at the poet's feet can be seen a tank with a swimming water-fowl. The whole is enclosed in a delicately traced treble border of floral designs. The

picture bears an inscription in the right-hand top-corner saying that it was made to order for Mirzā 'Alī al-Ḥākī in 1339 A.H. (=1920 A.D.).

## 5. CHINTAHARAN CHAKRAVARTI.

### *A number of Old Manuscripts in the Bengali Script.*

- (1) Setubandha of Pravarasena (A.S.B. Cat. No. 5801) copied in *Lakṣmaṇasaṃvat* 102 (?) (1222 A.D.).
- (2) Bhaṭṭikāvya (A.S.B. Cat. No. 5057) copied in Śaka 1326 (1404 A.D.).
- (3) Bodhicaryāvatāra (A.S.B. Cat. No. 19) copied in *Samvat* 1492 (1435 A.D.).
- (4) Prasannarūghava of Jayadeva (A.S.B. Cat. No. 5343) copied in Śaka 1414 (1492 A.D.).
- (5) Dharmaratna of Jimūtavāhana (A.S.B. Cat. No. 2653) copied at a date earlier than Śaka 1417 (1495 A.D.).
- (6) Mitākṣarā of Vijñāneśvara (A.S.B. Cat. No. 1870) copied in *Lakṣmaṇasaṃvat* 399 (1519 A.D.).
- (7) Śiśupālabaddham (A.S.B. Cat. No. 5073) copied in Śaka 1436 (1514 A.D.).
- (8) Kīrātārjuniya (A.S.B. Cat. No. 5039) copied in Śaka 1438 (1516 A.D.).
- (9) Śūdrapaddhati of Apipāla (A.S.B. Cat. No. 2141) copied in Śaka 1442 (1520 A.D.).
- (10) Śūdrapaddhati of Apipāla (A.S.B. Cat. No. 2142) copied in Śaka 1446 (1524 A.D.).
- (11) Commentary on Rāvaṇabaddha (A.S.B. Cat. No. 5802) copied in Śaka 1457 (1535 A.D.).
- (12) Mahābhārata (Droṇaparvan) (A.S.B.) estimated to be 400-500 years old.
- (13) Kṛṣṇakīrtana of the Library of the Vaṅgiya Sāhitya Pariṣat (supposed to have been copied towards the end of the 14th century).
- (14) Harivaṃśa of the Library of the Vaṅgiya Sāhitya Pariṣat copied in Śaka 1387 (1465 A.D.).
- (15) Mahābhārata (Ādiparvan) of the Library of the Vaṅgiya Sāhitya Pariṣat copied in Śaka 1422 (1500 A.D.).
- (16) Raghuvamśam of Kālidāsa of the Library of the Vaṅgiya Sāhitya Pariṣat copied in Śaka 1452 (1530 A.D.).

## 6. SIR LEWIS L. FERMOR.

### (1) *Carved Tibetan book cover.*

Group of mythological figures within an ornamental border. In the centre Avalokiteśvara. To the left Mañjuḥṣa, to the right Vajrapāṇi. To the left of Mañjuḥṣa, below, the Black Jambhala. To the right of Vajrapāṇi, below, the Yellow Jambhala. Round the central figure various representations of the Buddha showing different mudrās. In the upper row smaller representations of Śākyamuni, Maitreya, Aparimitāyū, Tārā and others.

### (2) *A wooden glud-par or 'ransom-printer' from Tibet.*

Tibet is a magic-ridden country. In disease, trouble or perplexity the magician is called in to give his help. One of his operations

consists in making a kind of scapegoat-images from barley or wheat dough. By proper incantations and the required rituals the evil spirit is imprisoned in this cake to be thrown away. The 'ransom-printer' here exhibited shows on one side the twelve years of the Tibetan year-cycle. If the year is found to be malignant, its influence is also magically transferred to the ransom-cake and thrown away. Another side shows the various authors of misfortune, evil spirits of different kinds, to be dealt with in the same manner. The house of misfortune is also represented, as well as various animals, to be offered in effigy to the gods, a divination table, and other items used in the ritual.

## 7. GEOLOGICAL SURVEY OF INDIA.

### (1) *Miscellaneous collection of geological specimens.*

The exhibit this year is mainly of an economic nature.

A series of specimens, displayed on a flow sheet, illustrates the copper industry which, during the last 5 years, has become firmly established in Singhbhum. The stages of smelting, from the copper ore, are traced; most of the refined copper is smelted with zinc (obtained from Australia), to yield brass (or yellow metal) which is so readily absorbed in the Indian bazaars.

Part of the exhibit illustrates something of the iron and steel industry. Specimens of a furnace charge are displayed—hematite (iron-ore), limestone, and coke.

For comparison with artificial coke, a specimen of natural coke is shown—this has been found along a thin sill of igneous rock which was injected into a coal seam.

Two specimens of coal illustrate the various components of normal coal, and also the curious 'ball-coal' sometimes found in coal seams.

Specimens of kyanite and sillimanite are typical examples of these minerals which have assumed such an importance in the glass and refractory-ware industry.

A large specimen of lepidolite is from an occurrence only recently found in India by an officer of the Geological Survey. Lepidolite is the principal source of lithia.

Bauxite specimens are exhibited, showing their typical structure. India's resources in this ore of aluminium are enormous, and they have yet to be widely exploited.

The rock salt industry of the Punjab is represented by some crystals of rock salt—also by three carvings from rock salt.

Quite a number of meteorites have fallen in India during recent months. They are represented here by three types: iron, stone, and stony-iron meteorites.

The specimens are suitably described by accompanying labels.

### (2) *Series of water-colour drawings.*

#### 1. *Mayo Salt Mines, Khewra (Punjab).*

Original water-colour drawing by A. B. Wynne, Geological Survey of India.

This water colour, made by Wynne during his survey of the Salt Range in the seventies of the last century, is illustrative of the type of scenery met with in that area.

The lower parts of the range are composed of the bright red Salt Marl, so prominently shown in this water colour. Within this red

marl of the Salt Mine hill just above Khewra village, seams of rock salt totalling at least 500 feet in thickness are included. These deposits have been exploited by mining since early historical times.

## 2. *Bhooj in Kutch.*

Original water-colour drawing by A. B. Wynne, Geological Survey of India.

This water colour, painted in 1869, shows the dipping Deccan trap and volcanic ash beds of Bhooj, which overlie steeply-dipping sandstones of Upper Jurassic age.

## 3. *The Girnar Peak from Datar hill.*

Original water-colour drawing by A. B. Wynne, Geological Survey of India.

The rugged hills illustrated in this painting are composed largely of gabbro.

## 8. S. L. HORA.

### *Drawings of the Aquarium Fishes of India.*

Quite a large number of Indian Aquarium fishes are highly prized in America and Europe but very little attention as hitherto been paid to these forms in this country. A set of drawings of these fishes in their natural colours and habitats has been prepared for exhibition in the Fish Gallery of the Indian Museum.

All the fishes exhibited here are found in ponds and pools in the neighbourhood of Calcutta and can be obtained without much difficulty. Generally, they can be kept in an aquarium with much less attention than the imported and more delicate 'Gold Fishes'.

## 9. M. HIDAYAT HUSAIN.

### *Tuhfat al-Aḥbār fī Uṣūl al-Ḥadīth wa'l Akḥbār.*

This is an entirely unknown work on the Science of Ḥadīth in which the classification and criticism of Ḥadīth (the record of actions or sayings of the Prophet and his Companions) are described by al-Ḥāfiẓ Abū'l Mafākhīr 'Abdallāh bin 'Abd ar-Raḥmān bin 'Abd al-Laṭīf al-Ḥusainī al-Wā'iz.

From the perusal of this work it appears that he was a pupil of eminent Muḥaddithīn (Traditionists) such as 'Abd ar-Raḥīm bin al-Husain al-'Irāqī (born A.H. 725, A.D. 1325, died A.H. 806, A.D. 1404), Shams ad-Dīn Abū'l Khair Muḥammad bin Muḥammad bin Muḥammad al-Jazarī (born A.H. 751, A.D. 1350, died A.H. 833, A.D. 1429), and Ghayāth ad-Dīn Abū'l Khair 'Abd ar-Raḥmān (the father of the author).

He wrote the work at Kirmān and dedicated it to the Chief Justice of the city 'Abd al-'Azīz at-Tūrānpushtī. The work was completed in A.H. 830 (A.D. 1426).

He is also the author of another work on Ḥadīth called *al-Musalsalāt*. The *Musalsal* is a Ḥadīth (tradition) which can be traced through an unbroken chain of trustworthy authorities to a companion of the Prophet. It records that all the narrators handed

down the traditions in question by solemn oath as to its truth or by claspng hands with the hearers in token of good faith. The first method is called *Musalsal al-half*, the second *Musalsal al-yad*. Of this work also no copies seem to be known.

The copy of the work exhibited is written in a very fine Naskh by 'Abd ar-Rahmān al-Bahrāmī ash-Shirāzī.

No copy of the work is found in any public library in India and Europe, nor mentioned in any accessible bibliography.

It was purchased by Mr. Johan van Manen in Calcutta.

The sole value of the volume is not its rarity. Of still greater importance is the nature of its contents. The manner of treatment is methodical, scholarly, and original. It is difficult to explain how so important a work could have escaped the attention of students and bibliographers of *Hadīth*. Its discovery is of importance.

## 10. JOHAN VAN MANEN.

### *Some Tibetan Tankas.*

Of late years increasing interest has been shown in Tibetan scroll-paintings, or tankas. G. de Roerich has in 1925 published a valuable monograph on the subject in which a large number of such tankas were reproduced. An appreciable amount of material on the subject is now available in print. The statement made in 1925 that 'our present knowledge of Tibetan pictorial art is not sufficient to enable us to discuss various schools of art' remains true.

It is, nevertheless, possible to discuss special points which from time to time arise. The purpose of this exhibit is to draw attention to a style of painting of a very distinct character, of which the examples known to the exhibitor are of a high artistic quality. The style is different from that of the majority of tankas, which are executed in a great variety of colours on the same scroll, and is limited to the use of a black background with all outlines in thin gold lines and the use of only red, or red and white, to colour clothing and skin.

A few samples are exhibited, showing various stages of development, and for purposes of comparison samples of the more common type of tanka are placed in juxtaposition.

## 11. J. N. MUKHERJEE, S. R. PALIT, and B. R. MAZUMDAR.

### *Displacement of equilibrium at interfaces.*

The displacement of the equilibrium in an aqueous solution when shaken with an immiscible solvent can be easily illustrated by using solutions of suitable indicators. The development of acid and alkaline reactions by the double decomposition of neutral salts of strong acids and bases is also illustrated by simple reactions.

## 12. BARON W. OW-WACHENDORF.

### (1) *The Buddha, representing the miracle of Sravasti, flames issuing from both shoulders.*

Grey schist. Found in tribal territory north of Rawalpindi. About 150 A.D.

### (2) *Stone Head of a female Goddess.*

Red sandstone. From the Central Provinces. About 500 A.D.



(3) *Crowned figure sitting on a throne. Second figure missing.*

Bronze. Rare specimen from the Kulu Valley. Early VIIIth century A.D.

(4.5) *Two figures, Vishnu and Lakshmi.*

Copper bronze. IXth and XIth centuries A.D. Similar to the Kurkihar and Nalanda Bronzes. Undoubtedly school of Bihar. Found at top of Manikiala Stupa near Rawalpindi.

## 13. GANAPATI SIRCAR.

*A Copper Inscription from Nandapur.*

On the east bank of the Ganges there is a village, Nandapur, two miles from Surajgarh, Monghyr, in Bihar. In this village, on the Ganges, there is a very old dilapidated temple, known as the temple of 'Burha Siva'. One portion of it has already been washed away by the Ganges and the remaining portion may go down any time. In this portion, fixed in a wall, this copper inscription was discovered. Mr. U. Ghose sent it to the exhibitor in February, 1929.

Length—6½ inches, with its head about 8 inches. Breadth—4½ inches. Character—Gupta Period. This inscription, not yet deciphered, is exhibited for the first time. Written on both sides—in front 15 lines, on the reverse 4 lines.

## 14. THE GENERAL SECRETARY.

(1) *The Society's publications of 1935.*

- (a) Journal and Proceedings.
- (b) Memoirs.
- (c) Advance Proceedings.
- (d) Bibliotheca Indica.
- (e) Proceedings, Indian Science Congress.

(2) *Some acquisitions of interest to the Library during 1935.*

- (a) Presentations.
- (b) Purchases.

(3) *Some recent publications by Members of the Society.*

- (a) Caland, W: The Kāthakagrihya-sūtra. Lahore, 1925.
- (b) Chakravarti, Sukumar: Caitanya et sa théorie de l'amour divin. Paris, 1933.
- (c) Chakravarti, Chintaharan: A Descriptive Catalogue of the Sanskrit Manuscripts in the Vangiya Sahitya Parishat. Calcutta, 1935.
- (d) Law, Bimala Churn: Śrāvasti in Indian Literature (Mem. Arch. Surv. India, No. 50). Delhi, 1935.
- (e) Konow, Sten: Saka Studies (Oslo Etnograf. Mus., Bull. 5). Oslo, 1932.
- (f) Bodding, P. O.: A Santal Dictionary. Vol. 2. Oslo, 1934.
- (g) Woolner, A. C.: The Jasmine Garland (Kundamala). Translated into English. Oxford, 1935.
- (h) Chanda, Ramaprasad: Medieval Indian Sculpture in the British Museum. London, 1936.

- (i) Prasad, Ganesh: A treatise on spherical Harmonics and the functions of Bessel and Lamé. Part I (Elementary). Benares, 1930.
  - (j) Prasad, Ganesh: A treatise on spherical Harmonics and the functions of Bessel and Lamé. Part II (Advanced). Benares, 1932.
  - (k) Tucci, Giuseppe: Indo-Tibetica II. Rin C'en bzañ po e la rinascita del Buddhismo nel Tibet intorno al mille. Roma, 1933.
  - (l) Tucci, Giuseppe: Indo-Tibetica III. I Templi del Tibet occidentale e il loro simbolismo artistico. Part I. Spiti e Kunavar. Roma, 1935.
  - (m) Tucci, G. and Gherzi, E.: Cronaca della missione scientifico Tucci nel Tibet occidentale (1933). Roma, 1934.
- (4) *Manuscript Drawings of Indian Fish and other animals recently acquired by the Asiatic Society of Bengal.*

These drawings, 146 of fish and 53 of other animals, have been acquired by the Society at the suggestion of Dr. S. L. Hora.

At the top of each drawing is written in pencil the scientific or the vernacular Indian name. In addition there are notes written in an old system of shorthand.

The paper of most of the drawings has a water-mark dated 1794, while some sheets are dated 1798. This shows that the drawings were made towards the end of the eighteenth century.

Now that the drawings are available in India, their history will be worked out in detail and the results presented to the members of the Society in due course. The greatest importance of these drawings lies in the fact that they add a new chapter to the history of Indian ichthyology. So far Hamilton (once Buchanan) has been regarded as the first person who made a systematic study of the fresh-water fishes of India, but the drawings under report show that someone had an equally keen interest in the study of these fishes before him.

With the new acquisition, the Asiatic Society of Bengal now possesses a unique collection of manuscript drawings of Indian fishes of great historic value.

- (5) *Selection from the Arabic and Persian MSS. acquired during 1935.*

- (a) *Tārīkh-i-Ishahān*, Two Volumes.
  - (b) *Tārīkh-i-Ibn-i-Asākir*, Seven Volumes.
  - (c) *Tazkiratu'l-Huffaz*, Four Volumes.
  - (d) *Lisānu'l-Mizān*, Six Volumes.
  - (e) *Tahzihu'l-Tahzib*, Twelve Volumes.
  - (f) *Tārīkh-i-Baghdād*, Fourteen Volumes.
  - (g) *Shazarātu'z-Zahab*, Eight Volumes.
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## ANNUAL REPORT FOR 1935.

The Council of the Asiatic Society of Bengal has the honour to submit the following report on the state of the Society's affairs during the year ending the 31st December, 1935.

### 1. Ordinary Members.

*Gains and losses.*—These were as follows during the year :—

<i>Gains.</i>		<i>Losses.</i>	
Elections carried forward	.. 8	Elections carried over	.. 7
New elections	.. 29	Applications withdrawn	.. 2
		Elections lapsed	.. 2
		Deaths	.. 10
		Resignations	.. 23
		Rule 38	.. 10
Total	.. 37	Total	.. 54

Initial total 442 ; net loss 17 ; final total 425.

*Rule 38.*—This Rule, dealing with members whose subscriptions are in arrears, was strictly applied and the names of 10 Members were subsequently removed from the roll for this cause.

*Membership List.*—The customary detailed cross-check of the membership lists with the membership card index was made at the end of the year.

*Non-resident Members.*—Their total at the end of the year was 107, leaving more than ever room for substantial expansion.

*Life-members.*—The total of our Life-members has decreased by one and now stands at 56. One was lost by death ; and no Members compounded during the year.

*Deaths.*—This year the loss to the Society by death has been heavy. Amongst the distinguished and especially valued members lost to us, whose memory will be cherished, and for whose departure the Society is the poorer, the following may be mentioned :—

Dr. P. J. Brühl (Life-member, 1909 and Ordinary Fellow, 1912).

Khan Bahadur Abdul Gaffar (Ordinary Member, 1926).

A. G. Lunan (Ordinary Member, 1929).

Dr. Jatindranath Maitra (Ordinary Member, 1918).

F. Williamson (Ordinary Member, 1934).

Dr. Ganesh Prasad (Ordinary Member, 1935).

Dr. Narendranath Basu (Ordinary Member, 1928).

### 2. Associate Members.

During 1935 one Associate Member was lost by death :—

Rev. Father H. Hosten, S.J. (1910).

No new Associate Member was elected during the year. The present number stands at 5 ; statutory maximum 15.

### **3. Special Anniversary Honorary Members.**

During the year the Society received to its great regret news of the death of one of the 12 Special Anniversary Honorary Members elected last year at the occasion of its 150th Anniversary :—

Dr. Henry Fairfield Osborn (1934).

### **4. Institutional Members.**

During the year no new institution was admitted to this class of membership.

Their total number remains the same, namely 7.

### **5. Ordinary Fellows.**

On the date prescribed by the regulations for the issue of nomination papers for the election of new Fellows there were no vacancies and consequently no election took place at the Annual Meeting held on the 4th February, 1935.

We lost through death the following two Ordinary Fellows :—

Lt.-Col. H. W. Acton (1930).

Dr. P. J. Bruhl (1912).

The following Ordinary Fellow resigned his membership in the Society :—

Sir C. V. Raman (1925).

At the end of 1935 the number of Ordinary Fellows was 44 ; statutory maximum 50.

### **6. Honorary Fellows.**

During the year no scholars were newly elected Honorary Fellows, and the following two distinguished Honorary Fellows were lost by death :—

Dr. Herbert Allen Giles (1917).

Dr. Sylvain Lévi (1920).

Their number at the end of the year was 24 ; statutory maximum 30.

### **7. Obituary.**

During the year the Society received to its great regret news of the death of the following distinguished relations :—

Sir John Thompson (An Ordinary Member, from 1909 to 1933).  
Sir D. P. Sarvadhikary (An Ordinary Member, from 1924 to 1935).  
Dr. G. N. Mukhopadhyaya (An Ordinary Member, from 1908 to 1931, and Fellow, from 1923 to 1931).

### 8. Condolences.

The Council expressed its condolences at the occasion of the death of the following distinguished personality deceased during the year :—

M. L. Finot, First Director of the French School of the Far East.

### 9. Council.

The Council met 13 times during the year. The attendance averaged 9 of the 19 component members.

The following resolutions of thanks were passed by the Council :—

To the Outgoing Members of Council for their services rendered to the Society and for their valued support given to the Council and a special vote of thanks to Sir Rajendra Nath Mookerjee.

To Baron Ow-Wachendorf for presenting to the Society the Official German Record of International Policies of the Great European Powers from 1871 to 1914, in 54 volumes.

To Sir B. L. Mitter for presenting to the Society a portrait of the late Mr. Pramatha Nath Bose.

To Sir B. L. Mitter for a donation for the institution of a medal in memory of the late Mr. Pramatha Nath Bose.

### 10. Office Bearers.

The changes in the Council during the year were as follows :—

Mr. Johan van Manen, Acting Honorary Treasurer, *vice* Dr. S. L. Hora, absent, from 12-3-35 to 29-3-35, and from 25-9-35 to 15-10-35.

Absences other than those mentioned above were :—

Sir Lewis Fermor, absent from 15-1-35 to 1-2-35; from 18-4-35 to 5-8-35; and from 17-9-35 to 1-11-35.

Dr. A. M. Heron, absent from 1-1-35 to 1-4-35; from 15-5-35 to 15-6-35; and from 25-9-35 to 18-10-35.

Mr. L. R. Fawcett, absent from 1-1-35 to 15-4-35; from 1-11-35 to 31-12-35.

Mr. Percy Brown, absent from 1-4-35 to 1-7-35.

Lt.-Col. R. N. Chopra, absent from 18-4-35 to 17-7-35.

Sir B. L. Mitter, absent from 11-4-35 to 25-6-35; and from 1-9-35 to 1-11-35.

Dr. S. K. Chatterji, absent from 1-5-35 to 1-9-35.

Dr. J. N. Mukherjee, absent from 31-5-35 to 30-9-35.

Sir U. N. Brahmachari, absent from 3-6-35 to 10-7-35.

Mr. C. C. Calder, absent from 1-6-35 to 1-12-35.

R. B. R. Chanda, absent from 5-8-35 to 9-9-35.

Justice Lort-Williams, absent from 15-7-35 to 5-11-35.

### 11. Committees of Council.

The standing Committees of Council during the year, namely, the Finance, Publication, and Library Committees, met monthly.

The following special sub-committees were appointed during the year :—

Sub-committee to review the general question of the creation of a new form of Associate Membership.

Sub-committee to draft a letter to be considered in circulation, with reference to the proposed cessation of excavations at Mahenjo Daro.

## 12. Finance Committee.

The Finance Committee continued during the year to meet on dates different from, and a few days prior to, those of the Council Meetings.

A Special Meeting to frame the budget for the next year was held in December.

## 13. Office.

*Staff.*—Mr. N. M. Ramachandran, File Clerk, left towards the end of the month of June and Mr. N. Norman was placed in charge of the filing.

*Subordinate Staff.*—In the subordinate staff the usual minor changes took place, which do not call for comment.

*Correspondence.*—This year the number of outgoing letters was 1,539 and that of incoming letters 2,601.

*Files.*—During the year intermittent work was continued with regard to our files, old and new, but not much real progress can be reported.

*Stock-room.*—Labelling, bundling, and registration of the contents of the stock-room were kept up-to-date during the year for new publications. The stock-books for new accessions and for sales were kept up.

*Distribution.*—No change was made in the mode of distribution of our periodicals and notices. A better system for the distribution of the free copies of new issues in the *Bibliotheca Indica* should be devised.

*Address.*—Printed address labels remained in use and the system of constant revision and addition which has been adopted enables us to keep the printed addresses up-to-date, month by month.

*Card Register.*—The card registers of the Society's membership and of that of the Indian Science Congress were kept up-to-date and checked at the close of the year.

*Circulars and Forms.*—The number of these printed during the year was 57. About Rs. 694 were expended under this head.

*Office Furniture.*—One office table and four wall-shelves for the library were acquired, as also two steel skeleton racks for files and current papers.

*Office Manual.*—This still remains a desideratum.

*Arrangement.*—No change was made in the present disposition of the rooms except that a room on the ground floor was vacated and placed at the disposal of the National Institute of Sciences of India for its office.

#### 14. Rules and Regulations.

During the year no changes were made in the Rules of the Society except that some minor changes were adopted in the Regulations of all the memorial awards. The Council framed Regulations for the award of the Pramatha Nath Bose Memorial Medal.

#### 15. Indian Science Congress.

*Twenty-second Session.*—The Twenty-second Annual Meeting of the Indian Science Congress, inaugurating its fourth circuit, was held (for the fourth time) in Calcutta, from January 2nd to January 8th, 1935, under the joint patronage of His Excellency the Right Honourable Earl of Willingdon, G.M.S.I., G.C.M.G., G.B.E., Viceroy and Governor-General of India, and His Excellency the Right Honourable Sir John Anderson, P.C., G.C.B., G.C.I.E., Governor of Bengal.

*President.*—Dr. J. H. Hutton, C.I.E., M.A., D.Sc., F.A.S.B., I.C.S., Deputy Commissioner, Kohima, Naga Hills, was President of the Congress.

*Proceedings.*—The Proceedings of the Congress were published during the second week of December. The publication contained 632 pages which was 88 pages of letterpress more than the year before. The number of abstracts sent in for reading to the Congress numbered this year 776 as against 626 last year.

*Administration.*—During the latter months of the year the usual administrative work for the Congress in connection with the next session (Twenty-third Congress), to be held in Indore, was performed by the Society's office, which also attended to the general administration of the Congress when this was not in session. This year the burden of work thrown on the Society's office was as heavy as usual.

*Programme and Abstracts.*—As in the previous years the programme of the meeting and the abstracts were sent, as far as was practicable, by post to all Members who had applied for membership before the date of their publication. This year this date was 5th December, two weeks earlier than last year.

*Finance.*—The Congress finances remained separate from those of the Society.

*Secretaries.*—The General Secretaries to the Congress were Dr. J. N. Mukherjee and Mr. W. D. West; and the Managing Secretary was Mr. Johan van Manen in his quality as General Secretary of the Asiatic Society of Bengal.

### **16. Indian Museum.**

The Society's representative on the Board of Trustees of the Indian Museum, under the Indian Museum Act, X of 1910, continued to be Rai Sir Upendra Nath Brahmachari Bahadur, Kt., who was reappointed as such for a further period of three years.

### **17. Kamala Lectureship.**

The Society's nominee to serve on the Election Committee of the Kamala Lectureship, administered by the Calcutta University, remained the same, Rai Sir Upendra Nath Brahmachari Bahadur, Kt.

### **18. National Institute of Sciences of India.**

The Society's representatives to serve on the Council of the National Institute of Sciences of India are Lt.-Col. R. N. Chopra and Mr. C. C. Calder.

### **19. Deputations.**

The Society received invitation to send representative to various functions of the undermentioned body :—

19th International Congress of Orientalists at Rome.

The Council invited Dr. S. K. Chatterji to represent the Society.

### **20. Honours.**

Amongst the Honours conferred during the year several were bestowed on members of the Society. The Society's President (Dr. L. L. Fermor), The Hon'ble Mr. Justice M. N. Mukherjee, Maharaja P. C. Bhanj Deo of Mayurbhanj, Mr. A. H. Ghuznavi, and Mr. W. M. Craddock received the honour of Knighthood, whilst Lt.-Col. R. Knowles was made a C.I.E.

### **21. Congratulations.**

Congratulations were sent to several of the above recipients of Civic Honours.

### **22. Visits.**

An appreciable number of distinguished visitors came to the Society during the year. Amongst them were scholars from China, England, Switzerland, and Germany.



Members of the Inter-University Board visited the Society in February.

### **23. Social Functions.**

No social functions were held by the Society during the year.

The President generously enabled the Society to maintain the traditional practice of providing, before the Ordinary Monthly Meetings, light refreshments to the Members and visitors present.

### **24. Elliott Prize for Scientific Research.**

The annual prizes for 1933 and 1934 for research in Chemistry and Physics, respectively, were, in the Annual Meeting of 1935, awarded to Prof. Nirmal Kumar Sen and Dr. D. P. Roy Chowdhury, respectively.

The prize offered for the year 1935 was for Geology and Biology (including Pathology and Physiology). The announcement regarding the prize will be made in the Annual Meeting of 1936.

The prize for next year, 1936, will be for research in Mathematics.

### **25. Barclay Memorial Medal.**

The (biennial) award of the Barclay Memorial Medal for conspicuous contributions to Medical and Biological Science with reference to India, for 1935, will be announced in the Annual Meeting of 1936.

The next award will be announced in the Annual Meeting in February, 1938.

### **26. Sir William Jones Memorial Medal.**

The (biennial) award of the Sir William Jones Memorial Medal for conspicuous researches in Science was announced in the Annual Meeting of 1935. The medal was bestowed on Rai Sir Upendra Nath Brahmachari Bahadur, Kt.

During the year the Council accepted Sir U. N. Brahmachari's suggestion and changed the period of the award into a triennial one. The next (triennial) award will be announced in the Annual Meeting of 1938.

### **27. Annandale Memorial Medal.**

The next (triennial) award, for important contributions to the study of Anthropology in Asia, will be announced in the Annual Meeting of 1937.

### **28. Joy Gobind Law Memorial Medal.**

The next (triennial) award of the Joy Gobind Law Memorial Medal for 1935, for conspicuously important work on Zoology in Asia, will be announced in the Annual Meeting of 1936.

### **29. Paul Johannes Brühl Memorial Medal.**

The (triennial) award of the Paul Johannes Brühl Memorial Medal for important contributions to the study of Asiatic Botany was announced in the Annual Meeting of 1935. The medal was bestowed on Mr. I. H. Burkill.

The next (triennial) award will be announced in the Annual Meeting of 1938.

### **30. Calcutta Indian Science Congress Prize.**

The first award of the prize was announced in the Annual Meeting of 1935 and the award was made to Dr. Meghnad Saha with special reference to his work for the Indian Science Congress.

The next award will be made in connection with the next session of the Congress to be held in Calcutta.

### **31. Pramatha Nath Bose Memorial Medal.**

During the year Sir B. L. Mitter, on behalf of the 'Pramatha Nath Bose Memorial Committee', donated a sum of Rs. 1,800 invested in 3½% Government Paper for the institution of a Pramatha Nath Bose Memorial Medal for conspicuously important contributions to practical or theoretical geology with special reference to Asia, to commemorate the life-work of Mr. Bose, who was a member of the Society for 32 years and a pioneer of geological science and practice in India.

It was decided to gratefully accept the donation. The award is to be triennial. Regulations for the award have been framed and passed by Council.

### **32. Society's Premises and Property.**

A sum of Rs. 2,000 was set aside during the year to be credited to the Building Repairs Fund.

During the year some petty repairs to the Society's building were effected. It is contemplated to undertake thorough repairs during the present year.

The various desiderata and problems existing under the heading Premises and Property have been mentioned in the

Annual Reports of the last few years and have to be kept in mind until realization.

### 33. Accommodation.

Old problems to be carried over as still needing attention are : the provision of a set of small work-rooms for various uses, and the shelving of the stock-rooms.

During the year a room on the ground floor was vacated and placed at the disposal of the National Institute of Sciences of India for its office.

The available shelving in the Islamic MSS. and printed works room has been completely filled and needs extension. The space available for extension is limited.

### 34. Artistic and Historical Possessions.

Sir B. L. Mitter presented to the Society a portrait of late Mr. Pramatha Nath Bose. This striking work of art has been gratefully accepted by the Society and has been hung in the Society's main hall.

### 35. Presentations, Donations, and Legacies.

Except for the presentations to be mentioned under the next heading the Society received a donation from Sir B. L. Mitter for the institution of a medal in memory of the late Mr. Pramatha Nath Bose.

### 36. Library.

*Permanent Library Endowment Fund.*—The fund received no further donations during the year. The accumulated interests permitted the purchase of one further paper of Rs. 1,000 (face value,  $3\frac{1}{2}$  per cent.) during the year. The total invested capital (face value) increased thereby to Rs. 14,000 and has to accumulate to a total of Rs. 30,000 before income will be available for expenditure.

*Accessions.*—The accessions to the library during the year, exclusive of about 200 periodicals received through exchange or otherwise, numbered 212 volumes, out of which 71 were purchased and 141 were acquired by presentation.

*Binding.*—During the year 498 units, including books, pamphlets, and periodicals, were bound at a cost of Rs. 625, out of a total budget allowance of Rs. 650 sanctioned for the purpose.

*Purchases.*—The allocation for the purchase of books for the year was Rs. 2,000, but actually an amount of Rs. 1,924

was spent. A special grant of Rs. 500 was made for the purchase of early Manuscript Drawings of Indian Fish and other animals. For the new year the grant has been fixed at Rs. 2,500.

*Shelving.*—A new block of wall-shelves was installed during the year to keep the most important works of reference more easily accessible. Installation of special steel shelving for manuscripts and books in the western section remains to be effected, and provision has also to be made for further steel shelving for the current accessions of periodical literature. Our available shelving space for printed books is also rapidly coming to an end.

*Presentations.*—The Consul General for Germany very graciously presented the Society with a set of *Die Grosse Politik der Europäischen Kabinette, 1871–1914, Herausgegeben von J. Lepsius, A. M. Bartholdy, F. Thimme, 54 Volumes.* These volumes now form a part of our library.

### 37. Finance.

(1) Appendix III contains the usual statements showing our accounts for 1935. No change has been made in the form of their presentation since the previous year.

(2) Two new statements occur in this year :—

- (1) Pramatha Nath Bose Memorial Fund Account, and
- (2) Fixed Deposit Account, Imperial Bank of India, Calcutta.

(3) One statement, still carried over for final adjustment, is :—

Statement No. 17. International Catalogue of Scientific Literature, London.

(4) The other statements are presented as in the previous year.

(5) The fund accounts again show their invested assets written down to the market values as at the end of the year, and Investment Account No. 25 shows the allocation of invested paper to each fund specifically, whilst both market and face values of the investments are shown in it.

(6) Statement No. 27 shows the Balance Sheet of the Society and the different funds administered by and through it.

(7) The funds belonging to, or administered by, the Society may be classified as follows :—

(a) General Fund.

- (i) Permanent Reserve.
- (ii) Working Balance.

(b) Specific Funds belonging to the Society.

(c) Funds administered by the Society.

At the end of the year, the position of these funds, as compared with their position at the end of 1934, was as follows :—

	Face Value.	Market Value.	Face Value.	Market Value.
	31st Dec., 1934.	31st Dec., 1934.	31st Dec., 1935.	31st Dec., 1935.
	Rs.	Rs.	Rs.	Rs.
1. General Fund ..	2,99,100	2,93,300	2,88,600	2,75,400
(a) Permanent Reserve	2,51,100	2,46,700	2,52,000	2,40,900
(b) Working Balance ..	48,100	46,600	36,600	34,500
2. Specific Funds belonging to the Society ..	46,600	45,400	59,000	58,500
3. Funds administered by the Society ..	29,500	28,800	39,500	38,500
	3,75,200	3,67,500	3,87,100	3,72,400

(8) During the year Rs. 864 were received through admission fees. As no ordinary member compounded as a life member and no Institutional Member joined during the year, the above amount as well as a sum of Rs. 61-11 cash balance which was brought forward from 1934, under this head aggregating to Rs. 925-11 was transferred to the Permanent Reserve in the usual manner by conversion at the market rates as on 31st December, 1935, of Government  $3\frac{1}{2}\%$  Paper to the Face Value of Rs. 1,000 belonging to the Temporary Reserve of the working balance, whilst a cash advance of Rs. 30-9 is being carried over to the ensuing year, for adjustment under this head.

(9) The Government of Bengal maintained the 20 per cent. cut in all grants made by them to the Society during the year.

The Society received the following grants from the above Government :—

For	Rs.	Statement.
Journals .. ..	1,600	1
O.P. Fund No. 1 .. ..	7,200	2
Sanskrit MSS. Fund .. ..	2,800	4
Do. .. ..	2,560	4
	14,160	

(10) The Government of Bengal annual grant of Rs. 3,000 in aid of the publication of the Arabic and Persian works of historical interest expired during the year. Government sanction is awaited for the renewal of the grant and it is hoped that same will be received and realized early in the new year.

(11) The income derived from advertising during the year amounted to Rs. 9,600.

(12) The temporary investments of funds in Fixed Deposit and Savings Bank are shown in Statement Nos. 22, 23, and 24.

(13) Statement No. 20 gives an account of the amounts due to and by the Society for membership subscriptions, sales of publications, and contingent charges.

(14) The Government Securities shown in Statement No. 25 are held in safe custody by the Imperial Bank, Park Street Branch. During the year, there was a slight depreciation of the Securities amounting to Rs. 4,074 affecting to that extent the book assets of the Society.

To simplify the accounts, the various investment units in the smaller Fund Accounts were converted into units of one and the same Government loan of the same denomination and amalgamated into single papers for each Fund.

(15) Municipal assessment. For the fourth time in succession the Corporation has enhanced the Assessment on the Society's premises. This time the increase has been so great as to cause serious apprehension. The matter has been placed in the hands of a professional firm of Income Tax Agents to protect the interests of the Society.

(16) The budget estimates for 1935 and the actuals for the year were as follows :—

Estimates.			Receipts.	Expenditure.
			Rs.	Rs.
Ordinary .. ..	..	..	53,700	53,700
Extraordinary ..	..	..	1,000	1,000
TOTAL			54,700	54,700
Actuals.				
Ordinary .. ..	..	..	56,011	53,529
Extraordinary ..	..	..	864	864
TOTAL			56,875	54,393

The ordinary income was about Rs. 2,311 more than estimated.

On the expenditure side also about Rs. 171 was expended less than the estimate.

(17) The year's working shows a decrease in the net balance to the extent of Rs. 1,313 as compared to that of last year, taking into account the depreciation of our investments which amounted to Rs. 4,074.

(18) The budget estimates for probable expenditure have as usual been framed to meet demands under various heads based on vigorous activity in all departments of the Society's work.

The receipts have been conservatively estimated.

## BUDGET ESTIMATES FOR 1936.

## . Ordinary Receipts.

	1935 Estimate.	1935 Actuals.	Budget Estimates for 1936.
	Rs.	Rs.	Rs.
Interest on Investments and Deposits {	10,000	10,013	10,000
	800	1,100	700
Advertising .. .. .	9,600	9,600	9,600
Annual Grant .. .. .	1,600	1,600	1,600
Donation .. .. .	..	150	..
Miscellaneous .. .. .	300	374	300
Members' Subscriptions .. .. .	9,500	10,414	10,000
Publications, Sales, and Subscriptions	5,000	5,460	5,000
Proportionate Share of Funds ..	7,000	7,000	7,000
Indian Science Congress Contribution	600	1,000	1,000
Rent .. .. .	9,300	9,300	9,300
<b>TOTAL ..</b>	<b>53,700</b>	<b>56,011</b>	<b>54,500</b>

## Ordinary Expenditure.

	Rs.	Rs.	Rs.
Salaries and Allowances .. .. .	30,000	31,856	31,500
Commission .. .. .	300	309	350
Stationery .. .. .	500	389	500
Fan, Light, and Telephone .. .. .	800	768	800
Taxes .. .. .	2,250	2,244	2,250
Postage .. .. .	1,400	1,349	1,500
Freight .. .. .	100	..	..
Contingencies .. .. .	900	720	800
Petty Repairs .. .. .	100	72	100
Insurance .. .. .	500	500	500
Menials' Clothing .. .. .	100	97	200
Office Furniture .. .. .	450	447	450
Building Repairs .. .. .	2,000	2,000	2,000
Provident Fund Share .. .. .	700	686	700
Audit Fee .. .. .	250	250	250
Books, Library .. .. .	2,000	1,924	2,500
„ (Special Grant) .. .. .	..	482	..
Binding, Library .. .. .	650	624	600
Journal and Memoirs .. .. .	9,900	7,868	6,000
Printing, Circular .. .. .	800	694	800
Donations .. .. .	..	200	..
Gratuity .. .. .	..	50	..
Permanent Reserve .. .. .	..	..	1,500
Replacement of Fans .. .. .	..	..	1,200
<b>TOTAL ..</b>	<b>53,700</b>	<b>53,529</b>	<b>54,500</b>

**Extraordinary Receipts.**

	1935 Estimate.	1935 Actuals.	Budget Estimates for 1936.
By Fees	Rs.	Rs.	Rs.
by Admission Fees .. ..	650	864	650
by Compounding Fees .. ..	300	..	300
by Institutional Membership Registration Fees .. ..	50	..	50
TOTAL ..	1,000	864	1,000

**Extraordinary Expenditure.**

To Permanent Reserve	Rs.	Rs.	Rs.
by Admission Fees .. ..	650	864	650
by Compounding Fees .. ..	300	..	300
by Institutional Membership Registration Fees .. ..	50	..	50
TOTAL ..	1,000	864	1,000

**38. Publications.**

*Journal.*—Of the *Journal and Proceedings*, Volume XXX, for 1934, one number consisting of 108 pages and 34 plates was issued to close the volume. The title-pages and index for this volume were also published.

Of the *Journal*, Volume I, for 1935, four numbers consisting of 468 pages and 8 plates were issued.

In all 576 pages and 42 plates were published during the year.

*Title of Journal.*—During the year it was decided to begin a Third Series of the *Journal*. The *Journal* is henceforth to be published in three parts: *Journal*, *Letters: Journal*, *Science*; and *Year-Book*. The *Year-Book* will contain the material hitherto published in the *Proceedings* but in an expanded form. For those who wish to bind the parts separately title-pages for the separate parts will be provided. There will also be title-pages for the complete volume of the three parts together.

*Memoirs.*—Of the *Memoirs* two numbers were published, aggregating 116 pages and 7 plates.

These two numbers constitute the seventh and eighth parts of Col. Sewell's series on Geographic and Oceanographic Research in Indian Waters.

*Indian Science Congress.*—The *Proceedings* of the 22nd Indian Science Congress, consisting of 632 pages and one table, were published during the year.



*Sales.*—A sum of Rs. 5,410 was realized, being Rs. 410 above the budget estimate.

*Expenditure.*—The expenditure on *Journal* and *Memoirs* was about Rs. 7,868.

*Advance Proceedings.*—Seven numbers were published during the year.

*Year-Book.*—The *Year-Book* for 1934 was completed in print and will be issued early in the present year.

### 39. The Baptist Mission Press.

Under the capable superintendence of Mr. P. Knight the Baptist Mission Press continued to act as our chief printers and again gave invaluable assistance and maintained closest co-operation.

### 40. Agencies.

Our European and Indian Agents remained the same throughout the year. An extension of the list for Asiatic countries is desirable.

### 41. Exchange of Publications.

During the year, the following applications for exchange with the Society's publications were considered by the Council, with the decisions as noted against them :—

<i>Publications of :</i>	<i>To be exchanged with :</i>
Lingnan University, Canton, China ..	<i>Journal.</i>
Book for Exchange Dept., U.S.S.R. Society for cultural relations with foreign countries, Moscow.	<i>Journal.</i>
Institut für Völkerkunde der Universität, Wien ..	<i>Journal.</i>
Government Epigraphist for India ..	<i>Journal (Letters).</i>
Sinensia, China ..	<i>Journal.</i>
Sze Chuan Research Society ..	<i>Journal.</i>

### 42. Meetings.

The Ordinary Monthly Meetings of the Society were held regularly every month, with the exception of January and May and the recess month of October. The recorded average attendance was 19 members and 4 visitors. The maximum attendance was in August with 25 members and 11 visitors.

Two meetings of the Medical Section were held during the year.

### 43. Exhibits.

In the Ordinary Monthly Meetings a number of exhibits were shown and commented upon by the exhibitors. The following may be mentioned :—

- S. L. Hora : An interesting Implement for Mud-fishing from Uttarbhag, Lower Bengal.
- Sir L. L. Fermor : Tubular Panjal Trap from Kashmir, and an Iron Horse from the Central Provinces.
- Baini Prashad : Ethnographical Specimens from the Naga Hills.
- V. P. Sondhi : A Coffin and a Skull from a lime-stone cave in the Southern Shan States, Burma.
- R. Chanda : A photograph of the tomb of 'Hindoo' Stuart (died in Calcutta, in 1828) in the South Park Street Cemetery, and photographs of four sculptures originally belonging to his collection and now exhibited in the British Museum.
- Percy Brown : Portrait of a Lady of the Elizabethan Period, and a miniature painting of a Mughal Prince.
- A. L. Coulson : The Perpeti meteorite ; additional stones from the Perpeti meteorite shower ; the Patwar meteorite.
- A. M. Heron : An artificial natural Freak from China.
- J. van Manen : A Babylonian clay Tablet with cuneiform inscriptions ; and some Tibetan Tankas.
- W. D. West : Cinematograph film of Quetta after the earthquake.

#### 44. Communications.

Apart from papers submitted both for reading and subsequent publication, a number of communications, not intended for subsequent publication, were made from time to time in the Ordinary Monthly Meetings.

Amongst such communications made during the year the following may be mentioned :—

Johan van Manen : Recent Advances in the study of Chinese Philosophy ; the word ch'ang in the Tao Te king.

#### 45. General Lectures.

During the year no General Lectures were given.

#### 46. Philology.

Four papers were read during the year to be published later. Three papers read in the previous years were published during the year.

One paper was read and also published during the year.

#### 47. Natural History : Biology.

One paper read in the previous year was published during the year.

One new paper was read and published during the year.

One paper was read during the year to be published later.

#### 48. Natural History : Physical Science.

One paper read in the previous year was published during the year.

### 49. Anthropology.

One paper read in the previous year was published during the year.

Six papers were read during the year to be published later.

### 50. Medical Section.

During the year two meetings of the Medical Section were held, as detailed below :—

November.	Speaker	S. L. Hora.
	Subject	Recent Indian cases of live Fishes impacted in the food and air passages of men.
	Speaker	B. G. Mallaya.
	Subject	Surgical aspect of live Fishes impacted in the human food and air passages.
December.	Speakers	Lt.-Col. R. N. Chopra and A. C. Roy.
	Subject	Some biochemical characteristics of snake

The recorded attendance averaged 6 members and 8 visitors.

### 51. Bibliotheca Indica.

*Works published.*—Actually published were four issues, Nos. 1520, 1521, 1523, and 1525, of an aggregate bulk of 11 fascicle units of 96 or 100 pages. The details are given in Appendix II to this report.

Of the above issues one constituted a complete work, namely :—

1. Maitri Upanisad, text and translation (Second and revised edition).

A separate reprint of the translation alone was also issued.

*Indian works continued.*—The following works were continued during the year :—

1. Manusmṛti, with the commentary of Medhatithi, Sanskrit.
2. Vaikhānasaśrautasūtram, text, Sanskrit.
3. Saundarānandakāvya, text, Sanskrit (Second and revised edition).
4. Ātmatattvaviveka, text, Sanskrit.

*Islamic works continued.*—In the Islamic Series work was continued on two works, namely :—

1. 'Amal-i-Šālih, Persian.
2. Rubā'iyāt of Umar-i-Khayyām, Persian.

### 52. Catalogue of Sanskrit Manuscripts.

Work on Volume VIII, on Tantra, advanced well. By the end of the year 240 pages were printed off, about 80 pages were in type, and a large instalment of the copy was made press-ready.

### 53. Arabic and Persian Manuscripts, Search and Catalogue.

The work in this department was steadily pursued.

*Binding.*—The binding and repairing of previously and newly acquired MSS. was continued and 50 MS. volumes were bound during the year, making a total of 1,108 MSS. bound and repaired since the end of 1924.

*Acquisitions.*—During the year twenty-nine manuscripts were acquired by purchase. A total amount of Rs. 167 was spent on these new acquisitions.

*Reference books.*—The collection of Persian and Arabic MSS. catalogues was again added to and its completion continues an object of attention. A number of biographical works of reference were also purchased during the year.

*Catalogue.*—The work on the Arabic Catalogue was very satisfactory and up to 432 pages were print-ordered during the year.

### 54. Numismatics.

One Numismatic Supplement (for 1934) was published during the year, aggregating 108 printed pages and 34 plates.

### 55. Royal Title.

Giving effect to a decision arrived at the year before, a formal application was made through H.E. the Viceroy for the privilege of being permitted to prefix the title 'Royal' before the Society's name.

## [APPENDIX I.]

## Membership Statistics.

(As calculated for December 31st, for 30 years.)

YEAR.	ORDINARY.							EXTRA-ORDINARY.					FELLOWS			
	PAYING.				NON-PAYING.			Total Ordinary Members.	Centenary Honorary.	Associate.	Institutional.	Anniversary Honorary.	Total.	Grand Total Membership.	Honorary.	Ordinary.
	Resident.	Non-Resident.	Foreign.	Total.	Absent.	Life.	Total.									
1906 ..	173	147	15	335	52	20	72	407	4	12	..	..	16	423	30	..
1907 ..	174	175	20	369	31	20	51	420	4	12	..	..	16	436	28	..
1908 ..	181	193	17	391	38	19	57	448	4	13	..	..	17	465	30	..
1909 ..	183	217	13	413	40	20	60	473	4	14	..	..	18	491	28	..
1910 ..	209	217	16	442	43	23	66	508	4	14	..	..	18	526	27	17
1911 ..	200	225	19	444	53	22	75	519	3	14	..	..	17	536	28	19
1912 ..	203	229	19	451	43	23	66	517	3	13	..	..	16	533	27	24
1913 ..	200	211	19	430	46	23	69	499	3	14	..	..	17	516	27	28
1914 ..	191	187	19	397	50	26	76	473	3	14	..	..	17	490	24	27
1915 ..	171	188	21	380	40	25	65	445	3	15	..	..	18	463	29	31
1916 ..	145	159	18	322	60	25	85	407	3	15	..	..	18	425	26	33
1917 ..	150	144	15	309	45	24	69	378	2	12	..	..	14	392	22	35
1918 ..	153	145	17	315	43	24	67	382	2	10	..	..	12	394	22	39
1919 ..	141	128	15	284	64	25	89	373	2	11	..	..	13	386	18	36
1920 ..	161	134	15	310	32	26	58	368	2	11	..	..	13	381	28	38
1921 ..	160	132	16	308	26	26	51	359	2	12	..	..	14	373	28	40
1922 ..	160	141	16	317	26	26	52	369	2	13	..	..	15	384	30	39
1923 ..	147	120	13	280	30	27	57	337	2	11	..	..	13	350	28	37
1924 ..	209	134	12	355	29	28	57	412	2	12	..	..	14	426	27	37
1925 ..	263	137	12	412	23	27	50	462	2	12	..	..	14	476	26	34
1926 ..	319	162	20	501	23	28	51	552	2	12	..	..	14	566	25	34
1927 ..	328	167	18	513	28	33	61	574	2	13	..	..	15	589	28	38
1928 ..	344	167	23	534	42	46	88	622	1	12	..	..	13	635	28	40
1929 ..	331	181	21	533	36	49	85	618	1	10	2	..	13	631	27	43
1930 ..	291	194	37	522	22	52	74	596	1	8	2	..	11	607	29	47
1931 ..	228	184	29	441	26	52	78	519	1	8	5	..	14	533	29	46
1932 ..	222	126	23	371	27	54	81	452	1	7	5	..	13	465	28	45
1933 ..	194	126	27	347	33	56	89	436	..	7	6	..	13	449	26	49
1934 ..	217	112	30	359	26	57	83	442	..	6	7	12	25	467	26	47
1935 ..	206	107	28	341	28	56	84	425	..	5	7	11	23	448	24	44

## [APPENDIX II.]

**List of Publications issued by the Asiatic Society of Bengal during 1935.****(a) Bibliotheca Indica :**

	Price
	Rs. A. P.
(1) Maitri Upanisad, English translation (1 unit) ..	1 0 0
(2) Maitri Upanisad, text and translation. Fasc. 3 (2 units) .. .. .	2 0 0
(3) Ṭabaqāt-i-Akbarī, Persian text. Vol. 3 : complete (6 units) .. .. .	6 0 0
(4) Kaṣṣhf Al-Hujub wal Astār 'An Asmā' Al-Kutub wal Asfār, text (2 units) .. .. .	2 0 0

**(b) Journal and Proceedings (New Series) :**

Vol. XXX : No. 3 (39 units) ..	14 10 0
Vol. I (Letters) : No. 1 (12 units) ..	4 8 0
Vol. I (Letters) : No. 2 (18 „ ) ..	6 12 0
Vol. I (Science) : No. 1 ( 6 „ ) ..	2 4 0
Vol. I (Science) : No. 2 ( 2 „ ) ..	0 12 0

Title-pages and Index for Vol. XXX. (Free to Members and Subscribers on application.)

**(c) Advance Proceedings :**

Vol. II : Nos. 1-7. (Free to Members.)

**(d) Memoirs :**

Vol. IX : No. 7 ( 5 units) .. .. .	2 13 0
Vol. IX : No. 8 (10 „ ) .. .. .	5 10 0

**(e) Miscellaneous :**

Proceedings, Twenty-second Indian Science Congress	15 0 0
--	--------



Abstract Statement  
of  
Receipts and Disbursements  
of the  
Asiatic Society of Bengal  
for  
the Year 1935



## STATEMENT No. 1.

1935.

General

## Income and Expenditure Account

			Rs.	As.	P.	Rs.	As.	P.
<b>TO ESTABLISHMENT.</b>								
Salaries and Allowances	..		31,906	12	6			
Commission	..	..	308	10	9			
						32,215	7	3
<b>GENERAL EXPENDITURE.</b>								
Stationery ..	..	..	388	15	0			
Fans and Light	..	..	462	15	0			
Telephone ..	..	..	305	5	2			
Taxes ..	..	..	2,244	7	0			
Postage ..	..	..	1,349	5	0			
Contingencies	..	..	766	11	7			
Printing Circulars, etc.	..	..	693	14	0			
Audit Fee ..	..	..	250	0	0			
Petty Repairs	..	..	72	13	6			
Insurance ..	..	..	500	0	0			
Menials' Clothing	..	..	96	6	0			
Donations ..	..	..	200	0	0			
Furniture ..	..	..	447	0	0			
						7,777	12	3
<b>LIBRARY AND COLLECTIONS.</b>								
Books ..	..	..	2,405	13	10			
Binding ..	..	..	624	8	0			
						3,030	5	10
<b>PUBLICATIONS.</b>								
Journal and Proceedings and Memoirs		....				7,867	11	6
<b>CONTRIBUTION TO FUNDS.</b>								
Provident Fund Contribution for 1935		....				685	2	0
						51,576	6	10
<b>TRANSFER TO—</b>								
Building Repair Fund Account	..	....				2,000	0	0
<b>SUNDRY ADJUSTMENTS.</b>								
Depreciation of Investments re-								
valued on 31-12-35 ..	..	....				4,077	2	0
Bad Debts written-off ..	..	....				943	0	0
BALANCE AS PER BALANCE SHEET ..		....				2,75,327	13	5
						3,33,924	6	3

## STATEMENT No. 1.

*Fund.*

1935.

for the year to 31st December, 1935.

---

	Rs.	As.	P.	Rs.	As.	P.
By BALANCE FROM LAST ACCOUNT ..	....			2,76,691	3	0

## CASH RECEIPTS.

Interest on Investments ..	10,013	6	0			
Interest on Fixed Deposits ..	1,099	14	6			
Advertising ..	9,600	0	0			
Miscellaneous ..	374	3	10			
Government grant ..	1,600	0	0			
Rent ..	9,300	0	0			
Contributions from Indian Science Congress ..	1,000	0	0			
Donations ..	150	0	0			
				33,137	8	4

## PERSONAL ACCOUNT.

Members' Subscriptions ..	10,621	0	0			
Admission Fees ..	864	0	0			
Miscellaneous ..	200	10	9			
				11,685	10	9

## TRANSFERS FROM FUNDS.

Proportionate Share in General Expenditure—						
O.P. Fund (1) Account ..	2,500	0	0			
Sanskrit MSS. Fund Account ..	2,000	0	0			
Arabic and Persian MSS. Fund Account ..	2,500	0	0			
				7,000	0	0
Publication Fund Account ..	....			5,410	0	2

---

3,33,924 6 3

---

## STATEMENT No. 2.

1935.

*Oriental Publication*

From a monthly grant made by the Government of Bengal for the publication of *Sanskrit* (Rs. 500), and for the publication of *Sanskrit* (Less 20% from the

---

	Rs.	As.	P.	Rs.	As.	P.
To Printing .. .. .	....			3,242	0	0
Proportionate Share in General Expenditure .. .. .	....			2,500	0	0
Balance as per Balance Sheet .. .. .	....			1,583	1	11
				<hr/>		
				7,325	1	11

---

## STATEMENT No. 3.

1935.

*Oriental Publication*

From an annual grant made by the Government of Bengal of *Historical* (Less 20% from the

---

	Rs.	As.	P.
To Balance from last Account .. .. .	500	6	4
Printing .. .. .	3,222	4	3
	<hr/>		
	3,722	10	7

---

## STATEMENT No. 4.

1935.

*Sanskrit Manuscripts Fund*

From an annual grant of Rs. 3,200 made by the Government of Bengal by the Society; and Rs. 3,600 from the (Less 20% from the

---

	Rs.	As.	P.	Rs.	As.	P.
To Pension .. .. .	120	0	0			
Cataloguing .. .. .	2,400	0	0			
Printing .. .. .	1,151	0	0			
Purchase of MSS. .. .. .	20	0	0			
	<hr/>			3,691	0	0
Proportionate Share in General Expenditure .. .. .	....			2,000	0	0
Balance as per Balance Sheet .. .. .	....			16,443	1	3
				<hr/>		
				22,134	1	3

---

## STATEMENT No. 2.

*Fund, No. 1, in Account with A.S.B.*

1935.

cation of Oriental Works and Works of Instruction in Eastern Languages  
 Works hitherto unpublished (Rs. 250).  
 1st of April, 1932.)

---

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	125 1 11
Annual Grant	..	....	7,200 0 0
			<hr/>
			7,325 1 11

---

## STATEMENT No. 3.

*Fund, No. 2, in Account with A.S.B.*

1935.

Rs. 3,000 for the publication of Arabic and Persian Works of  
 Interest.  
 1st of April, 1932.)

---

			Rs. As. P.
By Balance as per Balance Sheet	..	..	3,722 10 7
			<hr/>
			3,722 10 7

---

## STATEMENT No. 4.

*Account, in Account with A.S.B.*

1935.

for the publication of the Catalogue of Sanskrit Manuscripts acquired  
 same Government for Research Work.  
 1st of April, 1932.)

---

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	16,694 1 3
Annual Grant for Research Work,			
1935-36	..	2,880 0 0	
Annual Grant for Cataloguing	..	2,560 0 0	
		<hr/>	5,440 0 0
			<hr/>
			22,134 1 3

---

## STATEMENT No. 5.

1935.

*Arabic and Persian Manuscripts*

From an annual grant of Rs. 5,000 made by the Government of India for  
by the Society; for the purchase of further Manuscripts,  
Manuscripts found in

	Rs.	As.	P.	Rs.	As.	P.
To Manuscripts Purchase .. ..	433	4	0			
Binding .. ..	134	8	0			
Cataloguing .. ..	2,400	0	0			
				2,967	12	0
Proportionate Share in General Ex- penditure .. ..	....			2,500	0	0
Balance as per Balance Sheet ..	....			4,068	13	0
				9,536	9	0

## STATEMENT No. 6.

1935.

*Barclay Memorial*

From a sum of Rs. 500 odd given in 1896 by the Surgeon  
encouragement of Medical

	Rs.	As.	P.	Rs.	As.	P.
To Depreciation, Investments revalued on 31-12-35 .. ..	....			10	8	0
Balance as per Balance Sheet— Rs. 700, 3½% G.P.N., 1854-55 ..	669	6	0			
Surplus at date .. ..	10	5	8			
				679	11	8
				690	3	8

## STATEMENT No. 7.

1935.

*Servants' Pension Fund*

Founded in 1876 as the Piddington Pension Fund

	Rs.	As.	P.	Rs.	As.	P.
To Purchase of Investments during the year .. ..	....			195	5	5
Depreciation, Investment revalued on 31-12-35 .. ..	....			46	1	5
Balance as per Balance Sheet— Rs. 3,000, 3½% G.P.N., 1854-55 ..	2,868	12	0			
Surplus at date .. ..	20	1	6			
				2,868	13	6
				3,130	4	4

## STATEMENT No. 5.

*Fund Account, in Account with A.S.B.*

1935.

the cataloguing and binding of Arabic and Persian Manuscripts, acquired and for the preparation of notices of Arabic and Persian various Libraries in India.

---

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	4,536 9 0
Government grant for 1935-36	..	....	5,000 0 0

---

 9,536 9 0
 

---

## STATEMENT No. 6.

*Fund Account, in Account with A.S.B.*

1935.

General, I.M.S., for the foundation of a medal for the and Biological Science.

---

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	658 1 10
Interest realized for the year	..	....	32 1 10

---

 690 3 8
 

---

## STATEMENT No. 7.

*Account, in Account with A.S.B.*

1935.

with Rs. 500 odd from the Piddington Fund.

---

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	2,838 13 9
Interest realized for the year	..	....	96 1 2
Investment Account, credited at cost	.. ..	....	195 5 5

---

 3,130 4 4
 

---

# STATEMENT No. 8. 1935.

## *Annandale Memorial Fund* From donations by subscription,

	Rs.	As.	P.	Rs.	As.	P.
To Depreciation, Investments revalued on 31-12-35 .. .. .				60	0	0
Balance as per Balance Sheet—						
Rs. 4,000, 3½% G.P.N., 1854-55 ..	3,825	0	0			
Surplus at date .. .. .	351	5	9			
				4,176	5	9
				4,236	5	9

# STATEMENT No. 9. 1935.

## *Permanent Library Endowment* From gifts received,

	Rs.	As.	P.	Rs.	As.	P.
To Purchase of Investments .. .. .				976	11	1
Depreciation, Investments revalued on 31-12-35 .. .. .				215	7	1
Balance as per Balance Sheet—						
Rs. 14,000, 3½% G.P.N., 1854-55 ..	13,387	8	0			
Surplus at date .. .. .	211	5	8			
				13,598	13	8
				14,790	15	10

# STATEMENT No. 10. 1935.

## *Sir William Jones Memorial* From a sum gifted for the purpose in

	Rs.	As.	P.	Rs.	As.	P.
To Cost of a Medal .. .. .				289	14	0
Depreciation, Investments revalued on 31-12-35 .. .. .				45	0	0
Balance as per Balance Sheet—						
Rs. 3,000, 3½% G.P.N., 1854-55 ..	2,868	12	0			
Surplus at date .. .. .	16	3	0			
				2,884	15	0
				3,219	13	0

# STATEMENT No. 11. 1935.

## *Pramathanath Bose Memorial* From a sum gifted for the purpose in

	Rs.	As.	P.	Rs.	As.	P.
To Balance as per Balance Sheet—						
Rs. 800, 3½% G.P.N., 1842-43 } ..				1,721	4	0
„ 1,000, „ „ 1865 }						
				1,721	4	0

## STATEMENT No. 8.

*Account, in Account with A.S.B.*  
started in 1926.

1935.

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	4,102 6 7
Interest realized for the year	..	....	133 15 2
			4,236 5 9

## STATEMENT No. 9.

*Fund Account, in Account with A.S.B.*  
started in 1926.

1935.

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	13,352 11 3
Interest realized for the year	..	....	461 9 6
Investment Account, credited at			
Cost .. .. .	..	....	976 11 1
			14,790 15 10

## STATEMENT No. 10.

*Fund Account, in Account with A.S.B.*  
1926, by Dr. U. N. Brahmachari.

1935.

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	3,115 5 0
Interest realized for the year	..	....	104 8 0
			3,21 13 0

## STATEMENT No. 11.

*Fund Account, in Account with A.S.B.*  
1935.

1935.

		Rs. As. P.	Rs. As. P.
By Investment Account. Amount			
received from Sir B. L. Mitter as			
Donation, 3¼% G.P. Notes, per contra	....		1,721 4 0
			1,721 4 0



## STATEMENT No. 12.

1935.

*Joy Gobind Law Memorial*  
From a donation for the purpose in 1929,

	Rs. As. P.	Rs. As. P.
To Depreciation, Investments revalued on 31-12-35 .. .. .		45 0 0
Balance as per Balance Sheet—		
Rs. 3,000, 3½% G.P.N., 1854-55 ..	2,868 12 0	
Surplus at date .. .. .	264 7 0	
	<hr/>	3,133 3 0
		<hr/>
		3,178 3 0

## STATEMENT No. 13.

1935.

*Building Fund*

From a sum of Rs. 40,000 given by the Government of India  
proceeds of a portion

	Rs. As. P.
To Balance as per Balance Sheet .. .. .	6,321 9 6
	<hr/>
	6,321 9 6

## STATEMENT No. 14.

1935.

*Calcutta Science Congress Prize*

	Rs. As. P.	Rs. As. P.
To Depreciation, Investments revalued on 31-12-35 .. .. .		45 0 0
Balance as per Balance Sheet—		
Rs. 3,000, 3½% G.P.N., 1854-55 ..	2,868 12 0	
Surplus at date .. .. .	672 3 7	
	<hr/>	3,540 15 7
		<hr/>
		3,585 15 7

## STATEMENT No. 15.

1935.

*Dr. Bruhl Memorial Fund*

From a sum gifted for the purpose in 1929, by

	Rs. As. P.	Rs. As. P.
To Cost of a Medal .. .. .		9 6 0
Depreciation, Investments revalued on 31-12-35 .. .. .		15 0 0
Balance as per Balance Sheet—		
Rs. 1,000, 3½% G.P.N., 1854-55 ..	956 4 0	
Less Deficit at date .. .. .	10 1 0	
	<hr/>	946 3 0
		<hr/>
		970 9 0

## STATEMENT No. 12.

*Fund Account, in Account with A.S.B.*

1935.

by Dr. Satya Churn Law.

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	3,073 15 0
Interest realized for the year	..	....	104 4 0
			<hr/>
			3,178 3 0

## STATEMENT No. 13.

*Account, in Account with A.S.B.*

1935.

towards the rebuilding of the Society's premises, and from the sale of the Society's land.

			Rs. As. P.
By Balance from last Account	..	..	6,321 9 6
			<hr/>
			6,321 9 6

## STATEMENT No. 14.

*Fund Account, in Account with A.S.B.*

1935.

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	3,481 11 7
Interest realized for the year	..	....	104 4 0

---

 3,585 15 7
 

---

## STATEMENT No. 15.

*Account, in Account with A.S.B.*

1935.

the Brühl Farewell Committee.

		Rs. As. P.	Rs. As. P.
By Balance from last Account	..	....	935 13 0
Interest realized for the year	..	....	34 12 0

---

 970 9 0
 

---

## STATEMENT No. 20.

1935.

*Personal*


---

	Rs. As. P.	Rs. As. P.
To Balance from last Account ..	....	4,971 1 3
Advances .. ..	....	2,762 8 0
Asiatic Society's Subscriptions, etc...	11,685 10 9	
Subscriptions to Journal and Pro- ceedings, and from Book Sales, etc.	5,410 0 2	
	<hr/>	17,095 10 11

---

24,829 4 2

---

## STATEMENT No. 21.

1935.

*Publication Fund*

From sale proceeds

---

	Rs. As. P.	Rs. As. P.
To Books returned, etc. ..	....	150 8 0
Publications of the A.S.B. ..	....	5,410 0 2
Balance as per Balance Sheet ..	....	7,236 7 0

---

• 12,796 15 2

---

## STATEMENT No. 20.

Account.

1935.

		Rs.	As.	P.	Rs.	As.	P.
By Cash Receipts during the year	..	....			20,609	10	5
Bad Debts written-off, A.S.B.	..	943	0	0			
Books returned, etc.	..	150	8	0			
					1,093	8	0
Balance as per Balance Sheet	..	....			3,126	1	9

Outstandings.	Amount due to Society.			Amount due by Society.		
	Rs.	As.	P.	Rs.	As.	P.
Members	3,078	15	0	450	13	0
Subscribers	1	0	0	24	0	0
Bill Collector's Deposit				330	0	0
Miscellaneous	1,263	1	9	433	2	0
	4,373	0	9	1,246	15	0

---

24,829 4 2

---

## STATEMENT No. 21.

Account, in Account with A.S.B.

1935.

of publications.

		Rs.	As.	P.	Rs.	As.	P.
By Balance from last Account	..	....			7,197	15	9
Cash Sales of Publications	..	....			188	15	3
Credit Sales of Publications, etc.	..	3,946	0	2			
Subscriptions to Journal and Proceedings, etc.	..	1,464	0	0			
					5,410	0	2
					12,796	15	2

## STATEMENT No. 22.

1935.

## (1) Deposit Account

	Rs.	As.	P.	Rs.	As.	P.
To Balance from last Account ..	....			2,291	13	10
Deposit of Contributions during the year .. .. .	1,386	3	0			
Deposit of Advances returned ..	746	0	0			
Deposit of Interest realized during the year .. .. .	140	4	6			
				2,272	7	6
Interest realized for the year 1935 ..	...			53	3	0
				4,617	8	4

## STATEMENT No. 23.

1935.

## (2) Deposit Account

	Rs.	As.	P.
To Balance from last Account .. .. .	30,000	0	0
Deposit during the year .. .. .	45,100	0	0
	75,100	0	0

## STATEMENT No. 24.

1935.

## (3) Deposit Account

	Rs.	As.	P.
To Deposit during the year .. .. .	15,000	0	0
	15,000	0	0

**STATEMENT No. 22.***(Savings Bank Deposit with Imperial Bank of India).* 1935.

---

	Rs.	As.	P.	Rs.	As.	P.
By Withdrawal for Staff Advances, etc.	....			566	2	10
Balance as per Balance Sheet ..	....			4,051	5	6

---

 4,617 8 4
 

---

**STATEMENT No. 23.***(Fixed Deposit with Central Bank of India).* 1935.

---

			Rs.	As.	P.
By Withdrawals during the year ..	..		50,100	0	0
Balance as per Balance Sheet ..	..		25,000	0	0
			75,100	0	0

---

**STATEMENT No. 24.***(Fixed Deposit with Imperial Bank of India).* 1935.

---

			Rs.	As.	P.
By Balance as per Balance Sheet ..	..		15,000	0	0
			15,000	0	0

---

## STATEMENT No. 25.

1935.

## (4) Investment

		Rs. As. P.		Rs. As. P.	
To Balance from last Account ..		....		3,17,399 4 0	
Purchases during the year:					
Servants' Pension Fund ..		195 5 5			
Permanent Library Endowment Fund		976 11 1		1,172 0 6	
Pramathanath Bose Memorial Fund ..		....		1,721 4 0	
				3,20,292 8 6	

Face Value Rs.	FUNDS.	Rate in Rs. %	31st December, 1935, Valuation		31st December, 1931, Valuation including purchases during the year.		Depreciation or Appreciation.	
			Rs.	A. P.	Rs.	A. P.	Rs.	A. P.
ASIATIC SOCIETY OF BENGAL.								
PERMANENT RESERVE.								
16,700	3½% G.P. Notes, 1942-43	...	2,40,496	14 0	2,77,616	12 0	4,077	2 0
1,53,700	3½% G.P. Notes, 1954-55	...						
44,300	3½% G.P. Notes, 1965 ..	...						
6,000	3½% G.P. Notes, 1970	...						
30,500	3½% G.P. Notes, 1900-01	...						
2,51,500		95 10-						
500	3½% G.P. Notes, 1906-07	96 4-	431	4 0				
TEMPORARY RESERVE								
20,200	3½% G.P. Notes, 1900-01	95 10-	19,316	4 0	2,79,530	10 0	2,77,616	12 0
11,400	4½% Loan, 1955-60	116 10-	13,205	4 0				
BARCLAY MEMORIAL FUND.								
700	3½% G.P. Notes, 1954-55	95 10-	669	6 0	679	14 0	10	8 0
SERVANTS' PENSION FUND.								
3,000	3½% G.P. Notes, 1954-55	95 10-	2,968	12 0	2,719	8 0	46	1 5
					*195	5 5		
ANNANDALE MEMORIAL FUND.								
4,000	3½% G.P. Notes, 1954-55	95 10-	3,825	0 0	3,885	0 0	60	0 0
PERMANENT LIBRARY ENDOWMENT FUND.								
14,000	3½% G.P. Notes, 1954-55	95 10-	13,387	8 0	12,626	4 0	215	7 1
					*976	11 1		
SIR WILLIAM JONES MEMORIAL FUND.								
3,000	3½% G.P. Notes, 1954-55	95 10-	2,968	12 0	2,913	12 0	45	0 0
PRAMATHANATH BOSE MEMORIAL FUND								
800	3½% G.P. Notes, 1942-43	...	1,721	4 0	1,721	4 0	...	...
1,000	3½% G.P. Notes, 1965	...						
JOY GOBIND LAW MEMORIAL FUND.								
3,000	3½% G.P. Notes, 1954-55	95 10-	2,968	12 0	2,913	12 0	45	0 0
CALCUTTA SCIENCE CONGRESS PRIZE FUND.								
3,000	3½% G.P. Notes, 1954-55	95 10-	2,968	12 0	2,913	12 0	45	0 0
DR BRÜHL MEMORIAL FUND.								
1,000	3½% G.P. Notes, 1954-55	95 10-	956	4 0	971	4 0	15	0 0
8,17,100	Carried over	.....	8,05,574	0 0	8,10,188	2 6	4,559	2 6

## STATEMENT No. 25.

Account

1935.

	Rs.	As.	P.	Rs.	As.	P.
By Depreciation, Investments revalued on						
31st December, 1935 ..	....			4,240	6	6
Balance as per Balance Sheet ..	....			3,16,052	2	0

---

 3,20,292 8 6
 

---

Face Value Rs.	FUNDS.	Rate % Rs. %	31st December, 1935, Valua- tion.	31st December, 1934, Valua- tion includ- ing * pur- chases during the year.	Deprecia- tion or * Apprecia- tion.			
			Rs.	A. P.	Rs.	A. P.	Rs.	A. P.
3,17,100	Brought forward	.. ..	3,05,574	0 0	3,10,133	2 6	4,559	2 6
	PROVIDENT FUND.							
5,000	3% Loan, 1941	.. 103 13 -	5,190	10 0	5,059	6 0	...	...
6,000	Post Office 5-year Cash Certificates	.. 98 2 -	5,287	8 0	5,100	0 0	* 318	12 0
			10,478	2 0	10,159	6 0		
3,25,100		.....	3,16,052	2 0	3,20,292	8 6	4,240	6 6



## STATEMENT No. 27.

1935.

*Balance*

As at 31st

## LIABILITIES.

	Rs.	As.	P.	Rs.	As.	P.
General Fund Account .. ..	2,75,327	13	5			
Oriental Publication Fund No. 1 Account ..	1,583	1	11			
Sanskrit Manuscripts Fund Account ..	16,443	1	3			
Arabic and Persian Manuscripts Fund Account .. ..	4,068	13	0			
Barclay Memorial Fund Account ..	679	11	8			
Servants' Pension Fund Account ..	2,888	13	6			
Annandale Memorial Fund Account ..	4,176	5	9			
Permanent Library Endowment Fund Account .. ..	13,598	13	8			
Sir William Jones Memorial Fund Account ..	2,884	15	0			
Pramathanath Bose Memorial Fund Account .. ..	1,721	4	0			
Joy Gobind Law Memorial Fund Account ..	3,133	3	0			
Building Fund Account ..	6,321	9	6			
Calcutta Science Congress Prize Fund Account .. ..	3,540	15	7			
Dr. Brühl Memorial Fund Account ..	946	3	0			
Building Repair Fund Account ..	7,868	0	0			
International Catalogue of Scientific Literature Account .. ..	4,374	7	8			
Provident Fund Account ..	15,663	13	6			
Publication Fund Account ..	7,236	7	0			
				3,72,457	8	5
				3,72,457	8	5

We have examined the above Balance Sheet and the appended detailed accounts with the Books and Vouchers presented to us and certify that they are in accordance therewith, and, in our opinion, set forth correctly the position of the Society as at 31st December, 1935

PRICE. WATERHOUSE. PEAT &amp; CO.,

Calcutta,  
31st January, 1936

*Auditors.*  
Chartered Accountants,  
Registered Accountants.

## STATEMENT No. 27.

Sheet.

1935.

December, 1935.

## ASSETS.

	Rs. As. P.	Rs. As. P.
Oriental Publication Fund No. 2 Account	3,722 10 7	
Advances Account .. ..	1,135 0 0	
Personal Account .. ..	3,126 1 9	
	<hr/>	7,983 12 4
Deposits :—		
Savings Bank Deposit Account, Imperial Bank of India ..	4,051 5 6	
Fixed Deposit Account, Central Bank of India, Ltd. .. ..	25,000 0 0	
Fixed Deposit Account, Imperial Bank of India .. ..	15,000 0 0	
	<hr/>	44,051 5 6
Investment Account .. ..	.	3,16,052 2 0
Cash Account :—		
In hand .. ..	92 7 3	
With the Imperial Bank of India, on Current Account .. ..	4,277 13 4	
	<hr/>	4,370 4 7
		<hr/>
		3,72,457 8 5
		<hr/>

S. L. HORA,  
Honorary Treasurer.



## [APPENDIX IV.]

### Abstract Proceedings Council, 1935.

(Rule 48 f.)

#### ACCOMMODATION—

Office accommodation to the National Institute of Science. The General Secretary to see whether the north front room on the ground floor can be conveniently vacated and placed at the disposal of the Institute. The Secretary and Dr. Hora to decide final arrangement.  
No. 5. 28-1-35.

Report use of the Society's Hall for a Council Meeting of the National Institute of Sciences of India. Action approved.  
No. 1. 29-4-35.

Request for the use of the Society's hall by the Mining and Geological Institute of India. Action approved.  
No. 3. 29-7-35.

Request for the use of the Society's Hall by the Mining and Geological Institute of India. Grant : General Secretary's letter approved.  
No. 1. 25-11-35.

#### ANNUAL MEETING—

Annual Meeting. Arrangements approved.  
No. 7. 28-1-35.

Annual report. Approved.  
No. 8. 28-1-35.

#### ASSOCIATE MEMBERS—

Report death of Fr. H. Hosten, S.J. Announce. General Secretary to prepare an obituary notice.  
No. 2. 29-4-35.

#### BUILDING—

Recommendation Finance Committee No. 3(b) of 22-2-35.

Estimates periodical repairs to the building. The General Secretary and Honorary Treasurer to consider and make recommendations to Special Finance Committee before next following Council. Accepted by Council.  
No. 6. 25-2-35.

#### COMMITTEES—

Constitution of Standing Committees of the Society for 1935-36. The Standing Committees to be constituted as below :—

(a) *Finance Committee :*

President	}	<i>Ex-officio.</i>
Treasurer		
General Secretary		
Dr. A. M. Heron.		
Dr. J. N. Mukherjee.		

(b) *Library Committee :*

President	} <i>Ex-officio.</i>
Treasurer	
General Secretary	
Philological Secretary	
Jt. Philological Secretary	
Biological Secretary	
Physical Science Secretary	
Anthropological Secretary	
Medical Secretary	}
Library Secretary	

(c) *Publication Committee :*

President	} <i>Ex-officio.</i>
Treasurer	
General Secretary	
Philological Secretary	
Jt. Philological Secretary	
Biological Secretary	
Physical Science Secretary	
Anthropological Secretary	
Medical Secretary	}
Library Secretary	

No. 4.

25-2-35.

Fixing dates for the next Council and Committee Meetings. The Council and Committee Meetings to be held on Monday, the 16th December, 1935.

No. 10

25-11-35.

## CONDOLENCES—

Notice of decease of M. L. Finot, first Director of the French School of the Far East. Express the Society's condolences.

No. 1.

24-6-35.

Report receipt of news of death of (a) two Fellows Col. H. W. Acton and Dr. P. J. Bruhl, and (b) three former members of the Society, Sir John Thompson, Sir D. P. Sarvadhikary, and Dr. G. N. Mukhopadhyaya. Record and Announce.

No. 16.

30-9-35.

## CONGRATULATIONS AND THANKS—

Outgoing Council. The Chairman expressed the Council's thanks to the outgoing members of Council for their services rendered to the Society and for their valued support given to the Council.

Resolved that the Council's thanks be conveyed to the outgoing members, and a special vote of thanks to Sir R. N. Mookerjee.

No. 15.

28-1-35.

Donation from Sir B. L. Mitter for the institution of a medal in memory of the late Mr. P. N. Bose. Accept with thanks. The General Secretary to put up draft of rules.

No. 3.

25-2-35.

Report presentation by Baron Ow Wachendorf of the Official German Record of International Policies of the Great European Powers from 1871-1914 in 40 volumes. Record with thanks to donor.

No. 1.

29-7-35.

Presentation by Sir B. L. Mitter of a portrait of the late Mr. P. N. Bose. Accept with thanks to donor.  
No. 1. 26-8-35.

# COUNCIL—

**Outgoing Council.** The Chairman expressed the Council's thanks to the outgoing members of Council for their services rendered to the Society and for their valued support given to the Council.

Resolved that the Council's thanks be conveyed to the outgoing members, and a special vote of thanks to Sir R. N. Mookerjee.  
No. 15. 28-1-35.

Acceptance of seats on the Council by Council members. Record.  
No. 1. 25-2-35.

Recommendations of the Finance Committee of 22-2-35. Accept. Also resolved that the General Secretary (Mr. Johan van Manen) be authorised to officiate as Honorary Treasurer to the Society during the absence of the Honorary Treasurer, Dr. S. L. Hora, from 11th March, 1935, until notification of the latter's return to Calcutta and resumption of office.

No. 6. 25-2-35.

Absence of Philological Secretary from Calcutta. Record. Request Dr. Chatterji to represent the Society at the 19th International Congress of Orientalists at Rome.

No. 1. 27-5-35.

Absence of Physical Science Secretary from Calcutta. Record.  
No. 2. 27-5-35.

Absence of Honorary Treasurer from Calcutta. Resolved. That the General Secretary (Mr. Johan van Manen) be authorised to officiate as Honorary Treasurer to the Society during the absence of the Honorary Treasurer, Dr. S. L. Hora, from Thursday, the 26th September, 1935, until notification of the latter's return to Calcutta and resumption of office.

No. 5. 30-9-35.

Fixing dates for the next Council and Committee Meetings. The Council and Committee Meetings to be held on Monday, the 16th December, 1935.

No. 10. 25-11-35.

Informal consideration of the composition of Council for 1936-37. After discussion, the following list of candidates for nomination to next year's Council was placed before the meeting for consideration.

President	..	..	H. E. Sir John Anderson.
Vice-President	.	..	Sir David Ezra.
"	..	..	Sir U. N. Brahmachari.
"	..	..	Lt.-Col. R. Knowles.
"	..	..	Sir B. L. Mitter.
General Secretary	.	..	Johan van Manen.
Treasurer	..	..	Dr. S. L. Hora.
Phil. Secretary	..	..	Dr. S. K. Chatterji.
Jt. Phil. Secretary	..	..	Dr. M. Hidayat Hosain.
Nat. Hist. Secretary (Biology)	..	..	Dr. Bainsi Prashad.
" " " (Phys. Sci.)	..	..	Dr. J. N. Mukherjee.
Anthropological Secretary	..	..	R. B. R. Chanda.

Medical Secretary ..	..	Lt.-Col. R. N. Chopra.
Library Secretary ..	..	Dr. A. M. Heron.
Member of Council ..	..	Mr. Percy Brown.
" " ..	..	Mr. C. C. Calder.
" " ..	..	Mr. N. G. Majumdar.
" " ..	..	Mr. N. Barwell.
" " ..	..	Mr. K. C. Mahindra.
" " ..	..	Mr. M. Mahfuzul Haq.

Resolved that the General Secretary do print and circulate to the members of Council the list of the members of the Council as at present constituted together with the new list placed before the meeting and provided with a blank column for additional names and these lists be returned to the General Secretary within a week of date of issue; and that a list be compiled of the candidates finally proposed and be placed before the next Council Meeting to be voted upon.

No. 11.

25-11-35.

Council nomination, 1936-37. The General Secretary reported that all Council members had returned the list of candidates circulated, duly signed and unanimously approved without any alternate suggestion. Resolved that the list of names placed before the Council in November Council Meeting be declared that of the Council candidates for election to next year's Council, and that it be ordered to be issued to the Resident Members, as prescribed in Rule 44.

No. 12.

16-12-35.

#### DONATION—

Appeal from Sir C. C. Ghose Memorial Committee. A donation of Rs. 50 be given to the fund.

No. 13.

28-1-35.

Letter from the President suggesting to give a donation of Rs. 150 to the Quetta Earthquake Relief Fund. Send Rs. 150. Invite contributions from Council Members and Ordinary Members.

No. 2.

24-6-35.

Recommendation. Finance Committee No. 2 of 21-6-35. Suggestion from the President to donate a sum of Rs. 150 to the Quetta Earthquake Relief Fund from the Society. Recommended that Rs. 150 be paid at once and that subscriptions be invited from Council and members to maximum individual contribution of Rs. 10. Accepted by Council.

No. 4.

24-6-35.

Report response to the appeal for donation for the Quetta Earthquake Relief Fund. Record.

No. 2.

29-7-35.

#### EXCHANGE OF PUBLICATIONS—

Request for exchange of publications from Lingnan Science Journal, Lingnan University, Canton, China. Exchange Journal. Attempt to be made to obtain complete set by exchange.

No. 12.

29-7-35.

Request for exchange of publication from the Book Exchange Department, U.S.S.R. Society for cultural relations with Foreign Countries, Moscow. Grant.

No. 13.

29-7-35.

Request for exchange of publication from Institut für Volkerkunde der Universität, Wien, Austria. Exchange Journal.

No. 14.

29-7-35.

Application for exchange of publications from the Government Epigraphist for India Exchange Journal, Letters.

No. 1.

28-10-35.

Exchange of publications. Offer exchange with Journal Sinensia and Journal of the Sze Chuan Research Society.

No. 10.

28-10-35.

#### FELLOWS—

Report receipt of news of death of (a) two Fellows Col. H. W. Acton and Dr. P. J. Bruhl, and (b) three former members of the Society, Sir John Thompson, Sir D. P. Sarvadhikary and Dr. G. N. Mukhapadhyaya. Record and Announce.

No. 16.

30-9-35.

#### FINANCE—

Recommendation Finance Committee No. 3 of 25-1-35. Application from Duftris Ebrahim and Nawab Jan to be allowed to contribute to the Society's Provident Fund. Grant to Ebrahim; hold over the case of Nawab Jan. Accepted by Council.

No. 9.

28-1-35.

Appeal from Sir C. C. Ghose Memorial Committee. A donation of Rs. 50 to be given to the fund.

No. 13.

28-1-35.

Letter from the Government of Bengal regarding remuneration for work in connection with the preparation of the Descriptive Catalogue of Sanskrit MSS. Accept recommendation Finance Committee.

No. 2.

25-2-35.

Recommendation Finance Committee No. 3(a) of 22-2-35. Auditors' report for the year 1934. Record. The Honorary Treasurer to consider and report on necessary action. Accepted by Council.

No. 6.

25-2-35.

Recommendation Finance Committee No. 3(b) of 22-2-35. Estimates periodical repairs to the building. The General Secretary and Honorary Treasurer to consider and make recommendations to Special Finance Committee before next following Council. Accepted by Council.

No. 6.

25-2-35.

Recommendation Finance Committee No. 3(c) of 22-2-35. Remuneration to Mr. C. Chakravarti, Sanskrit MSS. Catalogue. Accept proposal if Council agrees; Mr. Chakravarti is required to submit a monthly progress statement of work. Accepted by Council.

No. 6.

25-2-35.

Recommendation Finance Committee No. 3(d) of 22-2-35. Withdrawal resignation, Cashier. Accept. Accepted by Council.

No. 6.

25-2-35.



Recommendations of the Finance Committee of 22-2-35. Accept. Also resolved that the General Secretary (Mr. Johan van Manen) be authorised to officiate as Honorary Treasurer to the Society during the absence of the Honorary Treasurer, Dr. S. L. Hora, from 11th March, 1935, until notification of the latter's return to Calcutta and resumption of office.

No. 6.

25-2-35.

Recommendation Finance Committee No. 3(a) of 22-3-35. Report by the Honorary Treasurer regarding outstanding amounts due to Society on account of sale of books referred to by the Auditors in their last report, etc. Action approved. Treasurer to take such further action as he thinks fit. Accepted by Council.

No. 3.

25-3-35.

Finance Committee No. 7 of 26-4-35. Additional Investments: Invest Rs. 1,000—Face Value  $3\frac{1}{2}\%$  paper for Permanent Library Fund. Invest Rs. 200 Face Value  $3\frac{1}{2}\%$  paper for Servants' Pension Fund. Recommended that the various Permanent Investments be simplified by amalgamation of small investments in single or rounded amounts if this can be done with little expense and without administrative difficulty. Accepted by Council.

No. 6.

29-4-35.

Finance Committee No. 8 of 26-4-35. Simplification investments. Recommended that the various Permanent investments be simplified by amalgamation of small investments in single or rounded amounts if this can be done with little expense and without administrative difficulty. Accepted by Council.

No. 6.

29-4-35.

Recommendation Finance Committee No. 9 of 26-4-35. Staff Salary increments. That the increments be given with effect from the beginning of the current year. Council order: Accept, with addition of Rs. 5 increase to Pandit B. B. Mukherjee with effect from 1st January, 1935.

No. 6.

29-4-35.

Recommendations of the Finance Committee of 26-4-35. Accept, with addition of Rs. 5 increase to Pt. B. B. Mukherjee with effect from 1st January, 1935.

No. 6.

29-4-35.

Recommendation Finance Committee No. 3 of 24-5-35. Letter from the Imperial Bank of India, Park Street Branch, regarding interest allowed on Fixed Deposits. Record. The Honorary Treasurer kindly to consider at the occasion of the next temporary investment falling due, investment in: (a) Treasury Bills for different periods, (b) Fixed Deposit, Imperial Bank, and to make recommendations. Accepted by Council.

No. 4.

27-5-35.

Finance Committee No. 4 of 24-5-35. Conversion Investment Fund Accounts. Except for Permanent and Temporary reserve funds consolidate all holdings into single papers of  $3\frac{1}{2}\%$  Government Loan of 1854-55, exchanging where necessary other scrip held into the scrip indicated. Accepted by Council.

No. 4.

27-5-35.

Recommendation Finance Committee No. 5 of 24-5-35. Increment of salary to menial staff. Increment to menials recommended according to the Honorary Treasurer's proposals. Accepted by Council.

No. 4.

27-5-35.

Recommendation Finance Committee No. 6 of 24-5-35. Application from Abdul Ghani, Library Duftri. The Honorary Treasurer to look into the matter and to make recommendation. Accepted by Council.

No. 4.

27-5-35.

Letter from the President suggesting to give a donation of Rs. 150 to the Quetta Earthquake Relief Fund. Send Rs. 150. Invite contributions from Council Members and Ordinary Members.

No. 2.

24-6-35.

Recommendation Finance Committee No. 2 of 21-6-35. Suggestion from the President to donate a sum of Rs. 150 to the Quetta Earthquake Relief Fund from the Society. Recommended that Rs. 150 be paid at once and that subscriptions be invited from Council and members to maximum individual contribution of Rs. 10. Accepted by Council.

No. 4.

24-6-35.

Removal of 10 names under Rule 38. Apply rules. Announce as removed from the member list under Rule 38.

No. 8.

24-6-35.

Report response to the appeal for donation for the Quetta Earthquake Relief Fund. Record.

No. 2.

29-7-35.

List of 14 members who are in arrears with subscriptions. Apply Rules.

No. 11.

29-7-35.

Absence of Honorary Treasurer from Calcutta. Resolved: That the General Secretary (Mr. Johan van Manen) be authorised to officiate as Honorary Treasurer to the Society during the absence of the Honorary Treasurer, Dr. S. L. Hora, from Thursday, the 26th September, 1935, until notification of the latter's return to Calcutta and resumption of office.

No. 5.

30-9-35.

Application from Shah Moinuddin Ahmad. Grant remission for two months without force of precedent.

No. 7.

30-9-35.

Application from Duftry Chummu. Restitute pay list deduction last month on compassionate allowance to applicant and also to other members of staff whose pay has been cut under similar circumstances.

No. 8.

30-9-35.

Application from Typist, N. Gupta. Leave granted for two weeks on half pay.

No. 9.

30-9-35.

Recommendation Finance Committee No. 9 of 24-9-35. Application from the Staff for Jubilee Bonus. Refer to Jubilee Committee. Accepted by Council.

No. 11.

30-9-35.

Finance Committee No. 10 of 24-9-35. Letter from Dr. Hora to Dr. Heron suggesting the purchase of 3 volumes of drawings on Indian Zoology. Recommendation: Council may be pleased to make a supplementary budget grant of Rs. 500 for the purchase, if possible, to be met wholly or partly by reappropriation from various budget heads at the end of the year. Accepted by Council.

No. 11. 30-9-35.

Recommendations of the Finance Committee of 24-9-35. Accept with the modifications dealt with above.

No. 11. 30-9-35.

Recommendation Finance Committee No. 2(b) of 25-10-35. Statement of Receipts and Expenditure of the Society for the nine months ending 30th September, 1935. That an additional budget grant of Rs. 700 be made to meet excess of expenditure under salaries, to be found from anticipated surplus income. Accepted by Council.

No. 4. 28-10-35.

Recommendations of the Finance Committee of 25-10-35. Accept, including the recommendations regarding an additional Budget grant.

Also resolved that the Honorary Treasurer be hereby authorised to transfer all temporary reserve funds to the Imperial Bank on fixed deposit when and as seems practical to him. For the intervening period moneys available may be deposited with the Central Bank on fixed deposit.

Also resolved that the Honorary Treasurer be hereby authorised to open a current account of Rs. 1,000 with an approved exchange bank as a permanent advance to obtain cheques for remittances to foreign countries and to be replenished from time to time when needed.

No. 4. 28-10-35.

Removal of names under Rule 40. Apply rules.

No. 8. 28-10-35.

Authority to make payments of bills during the end of the year. Resolved that the Hon. Treasurer and General Secretary be authorised to sign for and make payments of outstandings exceeding Rs. 100 during the period between the last Council Meeting of the year and the close of the year.

No. 12. 25-11-35.

Notice regarding the re-assessment from the Calcutta Corporation. Action approved.

No. 1. 16-12-35.

Recommendations of the Special Finance Committee of 13-12-35. Budget estimates for 1936. Accept. All fans to be replaced subject to funds being available.

No. 5. 16-12-35.

#### FURNITURE—

Recommendations of the Special Finance Committee of 13-12-35. Budget estimates for 1936. Accept. All fans to be replaced subject to funds being available.

No. 5. 16-12-35.

#### INDIAN MUSEUM—

Representation of the Society on the Board of Trustees of the Indian Museum. Sir U. N. Brahmachari to be the Society's representative.

No. 2. 25-11-35.

## INDIAN SCIENCE CONGRESS—

Recommendation of the Indian Science Congress Calcutta Prize Advisory Board. Accept the Board's recommendation, Dr. M. N. Saha.

No. 4.

28-1-35.

## JUBILEE CELEBRATIONS—

Anniversary Commemoration Volume. The General Secretary reported progress of preparation. Record, Division of editorial labours to be ascertained from previous records, and materials to be distributed accordingly to the members concerned.

No. 1 (special)

14-3-35.

## KAMALA LECTURESHIP—

Representation on the Selection Committee, Kamala Lectureship, Calcutta University. Sir U. N. Brahmachari to be the Society's representative.

No. 1.

28-1-35.

## LEASE—

Letter from the Standard Oil Co. of New York, Calcutta, requesting to assign the lease to the revised name of the Company as 'Standard Vacuum Oil Co.', Calcutta. That the General Secretary be empowered to make the required assignment on behalf of the Council.

No. 11.

29-4-35.

## LECTURES—

Proposed General Lecture by Mr. Sharma. N. G. Majumdar kindly to advise and on his recommendation an opportunity to be given to Mr. Sharma to expose his views to the public in the Society's hall.

No. 12.

29-4-35.

Public Lectures, winter session, 1935-36. Council members are invited to make offers of lecture to the General Secretary. The General Secretary to report in the next meeting.

No. 5.

29-7-35.

## LIBRARY—

Application for the loan of Dr. E. Herzfeld's 'Paikuli' from Mr. M. B. Darbari. Grant loan.

No. 1.

30-9-35.

Letter from Dr. S. L. Hora to Dr. A. M. Heron suggesting the purchase of a set of watercolour drawings of Indian plants and fishes. Ask to send on approval; safe return guaranteed; to be purchased if approved upon examination.

No. 4.

30-9-35.

Finance Committee No. 10 of 24-9-35. Letter from Dr. Hora to Dr. Heron suggesting the purchase of 3 volumes of drawings on Indian Zoology. Recommendation: Council may be pleased to make a supplementary budget grant of Rs. 500 for the purchase, if possible, to be met wholly or partly by reappropriation from various budget heads at the end of the year. Accepted by Council.

No. 11.

30-9-35.

## LOAN OF MSS.—

Report on manuscripts lent out during the month. Record. Recall manuscript of Sahasrika Prajna paramita within 10 days from date. Further resolved : that in future rules shall be strictly applied.

No. 1.

25-3-35.

Application for loan of Manuscripts from (1) Dr. P. C. Bagchi and (2) Dr. R. C. Majumdar : (1) Lend Buddhakalpa Tantra manuscript to Dr. Bagechi on bond of Rs. 200 ; (2) The Manuscript ' Habib-us-Sujar ' not to be loaned out ; to be kept in special custody.

No. 3.

29-4-35.

Application for loan of manuscripts from the Punjab University Library. Record.

No. 4.

29-7-35.

Report on manuscripts lent out during the month and new loan applications. Record. Issue after observation of usual formalities.

No. 3.

26-8-35.

Application for the loan of five Persian Manuscripts from the Librarian, Allahabad University. Grant loan Nos. 1, 2 and 5 ; decline that of Nos. 3 and 4 on account of rarity.

No. 2.

30-9-35.

Application for the loan of four Sanskrit Manuscripts from Mr. T. R. Chintamani, Madras. Ask Dr. Heron for the original application and grant loan.

No. 3.

30-9-35.

Report on manuscripts lent out during the month. Record. The Allahabad University may be allowed to execute a general bond for Rs. 1,000 as security against manuscripts to be lent to them from time to time.

No. 3.

28-10-35.

Applications for loan of Manuscripts from the Society : (a) Registrar, University of Madras ; (b) Bhandarkar Oriental Research Institute, Poona ; (c) M. Ramakrishna Kavi, Madras : (a) Only two MSS. to be lent out against Indemnity Bond for their value ; (b) Write that either a hand-written copy may be arranged for or a mechanical reproduction. Advice to be obtained regarding the use of the Society's reproducing apparatus ; (c) The applicant to be asked to apply for the manuscripts through Gaekwad's Oriental Institute or through any recognised Institution in Madras.

No. 5.

25-11-35.

## MANUSCRIPTS—

Letter from the Deputy Director to the Government of India, Department of Education, Health and Lands, to the Director General of Archaeology in India, regarding a collection of Manuscripts to be loaned to the Asiatic Society of Bengal. Accept, terms of letter of acceptance to be settled by General Secretary in consultation with Mr. N. G. Majumdar.

No. 9.

26-8-35.

**MEETINGS—**

Consideration of the programme of the Ordinary Monthly Meeting, May, 1935: (1) No meeting on the 6th May, Monday, on account of their Majesty's Jubilee Celebration. (2) The routine matters to be announced in the next General Meeting. (3) The Treasurer and General Secretary to arrange moderate gratuities to the menial staff.

No. 9.

29-4-35.

Date of next Ordinary Monthly Meeting. Next meeting in November.  
No. 14.

30-9-35.

**MEMBERSHIP—**

Associate Membership. A special Council to be held on the 14th or 15th March for the consideration of the Anniversary commemoration volume; the institution of Associate Membership; and the application for a Royal title.

No. 9.

25-2-35.

Associate membership. Resolved that the proposal for the creation of a new form of Associate membership be rejected. That a Sub-Committee consisting of Sir U. N. Brahmachari, Dr. J. N. Mukherjee, and Mr. Van Manen be constituted to review the general question and to report.

No. 2 (special).

25-3-35.

List of members in arrears with subscriptions. Apply Rules.

No. 10.

29-4-35.

Removal of 10 names under Rule 38. Apply rules. Announce as removed from the member list under Rule 38.

No. 8.

24-6-35.

List of 14 members who are in arrears with subscriptions. Apply Rules.

No. 11.

29-7-35.

Removal of 7 names under Rule 40. Apply rules.

No. 8.

28-10-35.

**MEMORIALS—**

Recommendation of the Sir William Jones Medal Advisory Board. Accept the Board's recommendation, Sir U. N. Brahmachari.

No. 2.

28-1-35.

Recommendation of the Bruhl Memorial Medal Advisory Board. Accept the Board's recommendation, Mr. I. H. Burkill.

No. 3.

28-1-35.

Recommendation of the Indian Science Congress Calcutta Prize Advisory Board. Accept the Board's recommendation, Dr. M. N. Saha.

No. 4.

28-1-35.

Donation from Sir B. L. Mitter for the institution of a medal in memory of the late Mr. P. N. Bose. Accept with thanks. The General Secretary to put up draft of rules.

No. 3.

25-2-35.

Framing of Regulations regarding the award of the 'Pramatha Nath Bose Memorial Medal': Draft approved with the additional clause

suggested by the General Secretary. To be recorded that the Medal Fund will be debited with the costs of making a die for the medal and that this debit will be gradually refunded to the Society from surplus of revenue over expenditure.

(1) The Medal shall be awarded every three years at the Ordinary Annual Meeting of the Asiatic Society of Bengal in February.

(2) The Medal shall be bestowed on a person who, in the opinion of the Council has made conspicuously important contributions to practical or theoretical Geology with special reference to Asia.

(3) The General Secretary shall at a meeting of the Council preceding the Ordinary Meeting in November place before the meeting the names of at least three Geological Experts and three members of the Society for consideration.

The Council shall then proceed to appoint an Advisory Board of not less than three members selected from the list placed before them provided that the Council, for special reasons, shall be entitled to select persons outside the list. The Advisory Board shall always include two Geological Experts and the General Secretary shall be an ex-officio member of the Board.

(4) The Advisory Board shall be termed 'The Pramatha Nath Bose Memorial Medal Advisory Board'. The Board shall appoint a Chairman from amongst its members who shall have a casting vote (in addition to his own vote) in the event of the number of votes being equally divided.

(5) The General Secretary shall call a meeting of the Advisory Board on the first convenient date subsequent to the first Monday of December, at the same time requesting members to bring with them to the meeting a detailed statement of the work or attainments of such candidates as they may wish to propose. The General Secretary shall also place before the Board for consideration detailed statements of the work or attainments of any other candidate submitted by any Fellow of the Society. The Board shall make such arrangements as may be necessary for the selection of a name to be submitted to the Council at their December meeting.

(6) Notwithstanding anything determined in these Regulations, it shall be within the competence of the Board to abstain from the selection of any name to be submitted for the year and to report accordingly to the Council, in which case, provided the Council concurs, the award for the year shall lapse.

No. 4.

29-4-35.

Recommendation Finance Committee No. 3 of 22-8-35. Letter from Sir U. N. Brahmachari suggesting that the period of award of Sir William Jones Memorial Medal may be changed from two years to three years. Recommend to Council the acceptance of the suggestion of Sir U. N. Brahmachari. Accepted by Council.

No. 4.

26-8-35.

Letter from Sir U. N. Brahmachari regarding the Sir William Jones Memorial Medal. Accept Sir U. N. Brahmachari's suggestion and change the period of the award into a triennial one. Further resolved that the advice of Sir B. L. Mitter be asked with regard to the wording of clause 6 of the Pramatha Nath Bose Memorial Medal, and that after revision by Sir B. L. Mitter this wording to be also adopted for all other medal awards in substitution of the present clause 6.

No. 8.

26-8-35.

Matters relating to the Regulations regarding the award of the 'Pramatha Nath Bose Memorial Medal'. Accept Sir B. L. Mitter's suggestions and modify accordingly clauses 1 and 6 of the regulations for all other awards.

No. 6.

30-9-35.

Appointment of Advisory Board for the award of: (a) *Barclay Memorial Medal*; (b) *Joy Gobind Law Memorial Medal*.

(a) The Board to consist of:

The President,  
Biological Secretary,  
Medical Secretary,  
Dr. S. L. Hora, and  
The General Secretary

with power to co-opt additional members;

(b) The Board to consist of:

The President,  
Biological Secretary,  
Dr. S. L. Hora,  
Dr. S. C. Law,  
Col. R. N. Chopra, and  
The General Secretary

with power to co-opt additional members.

No. 2.

28-10-35.

Recommendation of the Barclay Memorial Medal Advisory Board.  
Accept the Board's Recommendation, Dr. B. Sahni.

No. 9.

16-12-35.

Recommendation of the Joy Gobind Law Memorial Medal Advisory Board. Accept the Board's Recommendation, Prof. L. S. Berg.

No. 10.

16-12-35.

#### MISCELLANEOUS—

Letter from Prof. Vogel requesting back numbers of the Journal for the Kern Institute, Leiden, Holland, forwarded by Dr. Hora. Present one copy of every item of which more than 20 copies are available.

No. 2.

25-3-35.

Letter from the Private Secretary to H.E. the Viceroy regarding the Society's application for a Royal Charter. Record.

No. 2.

26-8-35.

Cessation of the excavations of Mohenjo Daro. A Sub-Committee consisting of Sir B. L. Mitter, Mr. Percy Brown, R. B. R. Chanda and Mr. Van Manen to draft a letter to be considered in circulation.

No. 3.

25-11-35.

Notification from the Calcutta Corporation regarding the Municipal Election. General Secretary to represent the Society.

No. 2.

16-12-35.

#### NATIONAL INSTITUTE OF SCIENCES OF INDIA—

Office accommodation to the National Institute of Science. The General Secretary to see whether the north front room on the ground floor can be conveniently vacated and placed at the disposal of the Institute. The Secretary and Dr. Hora to decide final arrangement.

No. 5.

28-1-35.

Report use of the Society's Hall for a Council Meeting of the National Institute of Sciences of India. Action approved.

No. 1.

29-4-35.



Representation of the Society on the Council of the National Institute of Sciences of India. Col. Chopra and Mr. Caldar to be the Society's representatives.

No. 3.

16-12-35.

#### PRESENTATIONS—

Report presentation by Baron Ow Wachendorf of the Official German Record of International Policies of the Great European Powers from 1871-1914 in 40 volumes. Record with thanks to donor.

No. 1.

29-7-35.

Presentation by Sir B. L. Mitter of a portrait of the late Mr. P. N. Bose. Accept with thanks to donor.

No. 1.

26-8-35.

#### PROVIDENT FUND.—

Recommendation Finance Committee No. 3 of 25-1-35. Application from Duftris Ebrahim and Nawab Jan to be allowed to contribute to the Society's Provident Fund. Grant to Ebrahim, hold over the case of Nawab Jan. Accepted by Council.

No. 9.

28-1-35.

Recommendation Finance Committee No. 5 of 26-7-35. Resignation of Mr. N. M. Ramachandran, File Clerk of the Society. Accept. Provident Fund Share to be paid for 5 years according to the regulations. Accepted by Council.

No. 7.

29-7-35.

#### PUBLICATIONS—

Division of the Journal. The two parts of the Journal to be styled JASB (Letters) and JASB (Science).

No. 14.

28-1-35.

Letter from the Government of Bengal regarding remuneration for work in connection with the preparation of the Descriptive Catalogue of Sanskrit MSS. Accept recommendation Finance Committee.

No. 2.

25-2-35.

Recommendation Finance Committee No. 3(c) of 22-2-35. Remuneration to Mr. C. Chakravarti, Sanskrit MSS. Catalogue. Accept proposal if Council agrees; Mr. Chakravarti is required to submit a monthly progress statement of work. Accepted by Council.

No. 6.

25-2-35.

Anniversary Commemoration Volume. The General Secretary reported progress of preparation. Record. Division of editorial labours to be ascertained from previous records, and materials to be distributed accordingly to the members concerned.

No. 1 (special).

14-3-35.

Recommendation, Publication Committee No. 1 of 25-3-35. Appointment of Secretary for the Publication Committee. Dr. Hora to be requested to accept the Secretaryship. Accepted by Council.

No. 5.

25-3-35.

Recommendation Publication Committee No. 2 of 25-3-35. Resolved that the Press Clerk be instructed to prepare a list of outstanding matter. Also resolved that the General Secretary be authorised to ask for certificates of press-readiness of papers placed before the Publication Committee and to press for speeding up the return of such papers. Accepted by Council.

No. 5.

25-3-35.

Recommendation Publication Committee No. 3 of 11-4-35 :  
(a) Present position of the Journal ; (b) Title lines. Journal.

(a) Record with satisfaction ; (b) In the new series the name of the author of article to be on the left-hand side and the title of paper to be on the right-hand side page heading. Council Order : Minutes to be first circulated to the Council before being considered by it. The Publication Secretary to be empowered to act at his discretion in the meantime with reference to all materials in hand in anticipation of sanction.

No. 8.

29-4-35.

Recommendation. Publication Committee No. 5 of 11-4-35. Duties of the Secretary of the Publication Committee and the procedure to be adopted for the meeting of the Committee. Secretary to carry on entire correspondence with the Members of the Publication Committee and to transmit to office instructions to be forwarded to author. General Secretary to correspond with the press. Council Order : Minutes to be first circulated to the Council before being considered by it. The Publication Secretary to be empowered to act at his discretion in the meantime with reference to all materials in hand in anticipation of sanction.

No. 8.

29-4-35.

Recommendations of the Publication Committee. Minutes of the Meeting held on 11th April, 1935, to be first circulated to the Council before being considered by it.

The Publication Secretary to be empowered to act at his discretion in the meantime with reference to all materials in hand in anticipation of sanction.

No. 8.

29-4-35.

#### REPRESENTATION—

Representation of the Society on the Board of Trustees of the Indian Museum. Sir U. N. Brahmachari to be the Society's representative.

No. 2.

25-11-35.

Representation of the Society on the Council of the National Institute of Sciences of India. Lt.-Col. R. N. Chopra and Mr. C. C. Caldar to be the Society's representatives.

No. 3.

16-12-35.

#### REQUESTS—

Request for exchange of publications from Lingnan Science Journal, Lingnan University, Canton, China. Exchange Journal. Attempt to be made to obtain complete set by exchange.

No. 12.

29-7-35.

Request for exchange of publication from the Book Exchange Department, U.S.S.R. Society for cultural relations with Foreign Countries, Moscow. Grant.

No. 13.

29-7-35.

Request for exchange of publication from Institut für Völkerkunde der Universität, Wien, Austria. Exchange Journal.

No. 14.

29-7-35.

Application for exchange of publications from the Government Epigraphist for India. Exchange Journal. Letters.

No. 1.

28-10-35.

Exchange of publications. Offer exchange with Journal Sinensia and Journal of the Sze Chuan Research Society.

No. 10.

28-10-35.

Request for the use of the Society's Hall by the Mining and Geological Institute of India. Grant ; General Secretary's letter approved.

No. 1.

25-11-35.

#### ROYAL CHARTER—

Letter from the Private Secretary to H. E. the Viceroy regarding the Society's application for a Royal Charter. Record.

No. 2.

Royal Title. The General Secretary to consult Mr. Justice J. Lort-Williams and the Private Secretary to H.E. the Governor of Bengal and to prepare a draft.

No. 3 (special)

14-3-35.

#### RULES AND REGULATIONS—

Framing of Regulations regarding the award of the ' Pramatha Nath Bose Memorial Medal '. Draft approved with the additional clause suggested by the General Secretary. To be recorded that the Medal Fund will be debited with the costs of making a die for the medal and that this debit will be gradually refunded to the Society from surplus of revenue over expenditure.

No. 4.

29-4-35.

(1) The Medal shall be awarded every three years at the Ordinary Annual Meeting of the Asiatic Society of Bengal in February.

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(4) The Advisory Board shall be termed ' The Pramatha Nath Bose Memorial Medal Advisory Board '. The Board shall appoint a Chairman from amongst its members who shall have a casting vote (in addition to his own vote) in the event of the number of votes being equally divided.

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Letter from Sir U. N. Brahmachari regarding the Sir William Jones Memorial Medal. Accept Sir U. N. Brahmachari's suggestion and change the period of the award into a triennial one. Further resolved that the advice of Sir B. L. Mitter be asked with regard to the wording of clause 6 of the Pramatha Nath Bose Memorial Medal, and that after revision by Sir B. L. Mitter this wording to be also adopted for all other medal awards in substitution of the present clause 6.

No. 8.

26-8-35.

Matters relating to the Regulations regarding the award of the 'Pramatha Nath Bose Memorial Medal'. Accept Sir B. L. Mitter's suggestions and modify accordingly clauses 1 and 6 of the regulations for all other awards.

No. 6

30-9-35.

## STAFF—

Recommendation Finance Committee No. 3(d) of 22-2-35. Withdrawal resignation, Cashier. Accept. Accepted by Council.

No. 6.

25-2-35.

Recommendation Finance Committee No. 9 of 26-4-35. Staff Salary increments. That the increments be given with effect from the beginning of the current year. Council order: Accept, with addition of Rs. 5 increase to Pandit B. B. Mukherjee with effect from 1st January, 1935.

No. 6.

29-4-35.

Recommendations of the Finance Committee of 26-4-35. Accept, with addition of Rs. 5 increase to Pandit B. B. Mukherjee with effect from 1st January, 1935.

No. 6.

29-4-35.

Consideration of the programme of the Ordinary Monthly Meeting May, 1935. The Treasurer and General Secretary to arrange moderate gratuities to the menial staff.

No. 9(3).

29-4-35.

Recommendation Finance Committee No. 5 of 24-5-35. Increment of salary to menial staff. Increment to menials recommended according to the Honorary Treasurer's proposals. Accepted by Council.

No. 4.

27-5-35.

Recommendation Finance Committee No. 6 of 24-5-35. Application from Abdul Ghaui, Library Duftri. The Honorary Treasurer to look into the matter and to make recommendation. Accepted by Council.

No. 4.

27-5-35.

Application from File Clerk, Ramachandran, for leave. Applicant to be examined by Col. Knowles.

No. 9.

24-6-35.

Recommendation Finance Committee No. 5 of 26-7-35. Resignation of Mr. N. M. Ramachandran, File Clerk of the Society. Accept. Provident Fund Share to be paid for 5 years according to the regulations. Accepted by Council.

No. 7.

29-7-35.

Application from Shah Moinuddin Ahmad. Grant remission for two months without force of precedent.

No. 7.

30-9-35.

Application from Duftry Chunnu. Restitute pay list deduction last month on compassionate allowance to applicant and also to other members of staff whose pay has been cut under similar circumstances.

No. 8

30-9-35.

Application from Typist, N. Gupta. Leave granted for two weeks on half pay.

No. 9.

30-9-35.

Recommendation Finance Committee No. 9 of 24-9-35. Application from the Staff for Jubilee Bonus. Refer to Jubilee Committee. Accepted by Council.

No. 11.

30-9-35.

#### TAXES—

Notice regarding the re-assessment from the Calcutta Corporation. Action approved.

No. 1.

16-12-35.

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**List of  
Patrons,  
Officers, Council Members, Members,  
Fellows, and Medallists  
of the  
Asiatic Society of Bengal,  
On the 31st December, 1935.**

## PATRONS OF THE ASIATIC SOCIETY OF BENGAL.

1931 ..	.. H.E. the Earl of Willingdon, G.M.S.I., G.C.M.G., G.M.I.E., G.B.E., Viceroy and Governor- General of India.
1932 ..	.. H.E. the Right Honourable Sir John Anderson, P.C., G.C.B., G.C.I.E., Governor of Bengal.
<hr/>	
1910-1916	.. Lord Hardinge of Penshurst, K.G., P.C., G.C.B., G.C.M.G., G.C.S.I., G.C.I.E., G.C.V.O. I.S.O.
1917-1922	.. Marquess of Zetland, P.C., G.C.S.I., G.C.I.E.
1922-1927	.. Earl of Lytton, P.C., G.C.S.I., G.C.I.E.
1926-1931	.. Viscount Halifax, K.G., P.C., G.C.S.I., G.C.I.E.
1927-1932	.. Colonel Sir Francis Stanley Jackson, P.C., G.C.I.E.

# OFFICERS AND MEMBERS OF COUNCIL OF THE ASIATIC SOCIETY OF BENGAL DURING THE YEAR 1935.

## Elections Annual Meeting.

### *President*

Sir Lewis Fermor, Kt., O.B.E., A.R.S.M., D.Sc. (London), F.G.S.,  
M.Inst. M.M., F.R.S., F.A.S.B.

### *Vice-Presidents.*

Sir David Ezra, Kt., F.Z.S., M.B.O.U.

Rai Sir Upendra Nath Brahmachari Bahadur, Kt., M.A., M.D., Ph.D.,  
F.S.M.F., F.A.S.B.

Lt.-Col. R. Knowles, B.A. (Cantab.), M.R.C.S., L.R.C.P., I.M.S., F.A.S.B.

The Hon'ble Sir B. L. Mitter, K.C.S.I., Barrister-at-Law.

### *Secretaries and Treasurer.*

General Secretary :—Johan van Manen, Esq., C.I.E., F.A.S.B.

Treasurer :—S. L. Hora, Esq., D.Sc. (Edm.), F.Z.S., F.R.S.E., F.A.S.B.

Philological Secretary :—S. K. Chatterji, Esq., M.A., D.Lit. (Lond.).

Joint Philological Secretary :—Shamsul 'Ulama Mawlawi M. Hidayat  
Hosain, Khan Bahadur, Ph.D., F.A.S.B.

Natural History Secretaries.  $\left\{ \begin{array}{l} \text{Biology :—Baini Prashad, Esq., D.Sc., F.Z.S.,} \\ \text{F.R.S.E., F.A.S.B.} \\ \text{Physical Science :—J. N. Mukherjee, Esq., D.Sc.} \\ \text{(Lond.), F.C.S. (Lond.).} \end{array} \right.$

Anthropological Secretary :—Rai Bahadur Ramaprasad Chanda, B.A.,  
F.A.S.B.

Medical Secretary :—Lt.-Col. R. N. Chopra, C.I.E., M.A., M.B., I.M.S.,  
F.A.S.B.

Library Secretary :—A. M. Heron, Esq., D.Sc. (Edin.), F.G.S., F.R.G.S.,  
F.R.S.E.

### *Other Members of Council.*

L. R. Fawcus, Esq., B.A. (Cantab.), I.C.S.

Percy Brown, Esq., A.R.C.A., F.A.S.B.

The Hon'ble Mr. Justice J. Lort-Williams, K.C., Barrister-at-Law.

C. C. Calder, Esq., B.Sc., F.L.S.

N. G. Majumdar, Esq., M.A.

### APPOINTMENTS, TRANSFERS, AND OTHER CHANGES DURING THE YEAR.

Mr Johan van Manen, Acting Honorary Treasurer, vice Dr. S. L. Hora,  
absent, from 12-3-35 to 29-3-35, and from 25-9-35 to 15-10-35.

Sir Lewis Fermor, absent from 15-1-35 to 1-2-35; from 18-4-35 to 5-8-35;  
and from 17-9-35 to 1-11-35.

Dr. A. M. Heron, absent from 1-1-35 to 1-4-35; from 15-5-35 to 15-6-35;  
and from 25-9-35 to 18-10-35.

Mr. L. R. Fawcus, absent from 1-1-35 to 15-4-35; from 1-11-35 to  
31-12-35.

Mr. Percy Brown, absent from 1-4-35 to 1-7-35.

Lt.-Col. R. N. Chopra, absent from 18-4-35 to 17-7-35.

Sir B. L. Mitter, absent from 11-4-35 to 25-6-35; and from 1-9-35 to  
1-11-35.

Dr. S. K. Chatterji, absent from 1-5-35 to 1-9-35.

Dr. J. N. Mukherjee, absent from 31-5-35 to 30-9-35.

Sir U. N. Brahmachari, absent from 3-6-35 to 10-7-35.

Mr. C. C. Calder, absent from 1-6-35 to 1-12-35.

R.B. R. Chanda, absent from 5-8-35 to 9-9-35.

Justice Lort-Williams, absent from 15-7-35 to 5-11-35.



**OFFICERS AND MEMBERS OF COUNCIL OF  
THE ASIATIC SOCIETY OF BENGAL  
ELECTED FOR THE YEAR 1936.**

*President.*

H.E. The Rt. Hon'ble Sir John Anderson, P.C., G.C.B., G.C.I.E.

*Vice-Presidents.*

Sir David Ezra, Kt., F.Z.S., M.B.O.U.

Rai Sir Upendra Nath Brahmachari Bahadur, Kt., M.A., M.D.,  
Ph.D., F.A.S.B.

Lt.-Col. R. Knowles, C.I.E., B.A. (Cantab.), M R C.S., L.R.C.P.,  
I.M.S., F.A.S.B.

The Hon'ble Sir B. L. Mitter, K.C.S.I., Barrister-at-Law.

*Secretaries and Treasurer.*

General Secretary :—Johan van Manen, Esq., C.I.E., F.A.S.B.

Treasurer :—S. L. Hora, Esq., D.Sc. (Edin.), F.Z.S., F.R.S.E.,  
F.A.S.B.

Philological Secretary :—S. K. Chatterji, Esq., M.A., D.Lit.  
(London).

Joint Philological Secretary :—Shamsu'l 'Ulama Mawlawi  
M. Hidayat Hosain. Khan Bahadur. Ph.D., F.A.S.B.

Natural History Secretaries. { Biology :—Baini Prashad, Esq., D.Sc., F.Z.S.,  
F.R.S.E., F.A.S.B.  
{ Physical Science :—J. N. Mukherjee, Esq.,  
D.Sc. (Lond.), F.C.S. (Lond.).

Anthropological Secretary :—Rai Bahadur Ramaprasad Chanda,  
B.A., F.A.S.B.

Medical Secretary :—Lt.-Col. R. N. Chopra, C.I.E., M.A., M.B.,  
I.M.S., F.A.S.B.

Library Secretary :—A. M. Heron, Esq., D.Sc. (Edin.), F.G.S.,  
F.R.G.S., F.R.S.E.

*Other Members of Council.*

Percy Brown, Esq., A.R.C.A., F.A.S.B.

C. C. Calder, Esq., B.Sc., F.L.S.

N. G. Majumdar, Esq., M.A.

Lt.-Col. N. Barwell, M.C., M.A., Barrister-at-Law.

K. C. Mahindra, Esq., B.A. (Cantab.).

M. Mahfuz-ul Haq, Esq., M.A.

## ORDINARY MEMBERS.

R=Resident. N=Non-Resident. F=Foreign. A=Absent. L=Life.

An Asterisk is prefixed to names of Ordinary Fellows of the Society.

Date of Election.		
5-4-22	R	<b>Abdul AH</b> , ABUL FAIZ MUHAMMAD, M.A., M.R.A.S., F.R.S.L., F.R.G.S., F.R.H.S. 3, Turner Street, Calcutta.
7-3-27	R	<b>Abdul Kadir</b> , A. F. M., M.A. (ALLAHABAD), MAULVIE FAZIL (PUNJAB), MADRASSAH FINAL (CALCUTTA), <i>Professor, Islamia College</i> . 19, Wellesley Square, Calcutta.
2-11-25	N	<b>Acharya</b> , PARAMANANDA, B.Sc., <i>Archæological Scholar</i> . Mayurbhanj State, Baripada.
2-3-21	R	<b>Aghbarkar</b> , SHANKAR PURUSHOTTAM, M.A., PH.D., F.L.S., <i>Sir Rash Behari Ghose Professor of Botany, Calcutta University</i> . 35, Ballygunge Circular Road, Calcutta.
1 1-34	N	<b>Ahmad</b> , MIAN JAMAL-UD-DIN, B.A., B.T., <i>Member, Bureau of Education, Afghanistan</i> . 2, Andرابي, Kabul, Afghanistan.
6-6-17	N	<b>Aiyangar</b> , K. V. RANGASWAMI, RAO BAHADUR, M.A., <i>Late Director of Public Instruction, Travancore; Principal, Central Hindu College, Hindu University</i> . Benares.
6-12-26	N	* <b>Aiyangar</b> , S. KRISHNASWAMI, M.A., PH.D., M.R.A.S., F.R.HIST.S., F.A.S.B., <i>Rajasevasakta, Professor, University of Madras</i> . "Sripadam", 143, Brodies Road, Mylapore, Madras, S.
1-12-20	N	<b>Akbar Khan</b> , THE HON'BLE MAJOR NAWAB SIR MOHAMMED, K.B.E., C.I.E., <i>Khan of Hoti</i> . Hoti, N.-W.F.P.
3-7-12	F	<b>Andrews</b> , EGBERT ARTHUR, B.A. c/o The Royal Empire Society, Northumberland Avenue, London, W.C.
3-3-30	L	<b>Ashton</b> , HUBERT SHORROCK, <i>Merchant</i> . Trueloves, Ingates-tono, Essex, England.
3-9-34	R	<b>Auden</b> , JOHN BICKNELL, M.A. (CANTAB.), F.G.S., <i>Assistant Superintendent, Geological Survey of India</i> . 27, Chow-ringhee, Calcutta.
3-11-30	R	<b>Austin</b> , GEORGE JOHN, <i>Sanitary Engineer, Messrs. J. B. Norton &amp; Sons, Ltd.</i> Norton Building, Lalbazar, Calcutta.
4-4-17	N	<b>Awati</b> , P. R., B.A. (CANTAB.), D.I.C., I.E.S., <i>Professor of Zoology</i> . Royal Institute of Science, Mayo Road, Fort, Bombay.
3-3-14	L	* <b>Bacot</b> , J., F.A.S.B. Boulevard Saint-Antoine, 61, Versailles Seine-et-Oise, France.
1-11-26	R	<b>Bagchi</b> , PROBODH CHANDRA, M.A., DR.-ES-LETTRES (PARIS), <i>Member of the A.S. of Paris; Lecturer, Calcutta University</i> . 9, Rustomjee Street, Ballygunge, Calcutta.
1-3-26	R	<b>Bagnall</b> , JOHN FREDERICK, B.Sc., A.M.I.Mech.E., A.M.I.E.E., A.M.Inst.C.E., <i>Consulting Engineer, Messrs. Macneill &amp; Co.</i> 2, Fairlie Place, Calcutta.

Date of Election.		
2-4-24	N	<b>Bahl, K. N., D.SC., D.PHIL., Professor of Zoology, Lucknow University. Badshabagh, Lucknow.</b>
7-3-27	A	<b>Bake, A. A., Doctorandus Or. Lit. P.O. Santiniketan. (c/o The Kern Institute, Leiden, Holland.)</b>
6-2-18	N	<b>Banerjee, NARENDRA NATH, M.I.P.O.E.E., A.M.I.E., Director of Telegraphs, Bombay Circle, Bombay.</b>
5-3-24	R	<b>Banerjee, P. N., M.A. (CANTAB.), A.M.I.E., F.C.U., Civil Engineer. 12, Mission Row, Calcutta.</b>
1-11-26	N	<b>Barhut, THAKUR KISHORESINGH JI, State Historian of Patiala Government. History and Research Department, Patiala.</b>
3-8-31	N	<b>Barua, THE HON'BLE KANAK LAL, RAI BAHADUR, B.L., F.R.S.E., President, Kamarupa Anusundhan Samiti, Minister to the Government of Assam. Rosaville, Nangthymai, Shillong, Assam.</b>
3-12-23	R	<b>Barwell, N. F., LT.-COL. (RETD.), M.C., M.A., Bar.-at-Law. First Floor, 10, Middleton Street. Calcutta (and) Aylmerton House, Aylmerton, Norfolk, England.</b>
6-1-30	A	<b>Bassewitz, COUNT, late Consul-General for Germany. Europe.</b>
4-3-29	R	<b>Basu, THE HON'BLE BEJOY K., C.I.E., M.A., B.L., Solicitor, High Court. 50, Goaltdule Road, Bhawanipore, Calcutta.</b>
3-12-24	R	<b>Basu, JATINDRA NATH, M.A., M.L.C., Solicitor. 14, Baloram Ghose Street, Calcutta.</b>
1-3-26	R	<b>Basu, NARENDRA KUMAR, M.L.C., Advocate, High Court. 12, Ashu Biswas Road, Bhawanipore, Calcutta.</b>
2-1-28	R	<b>Basu, NARENDRA MOHAN, M.S.C., Professor of Physiology. 63, Hindusthan Park, Ballygunge, Calcutta.</b>
7-1-29	R	<b>Basu, SARAT CHANDRA, Advocate. 143, Dhurumtollah Street, Calcutta.</b>
30-9-35	N	<b>Basu, SATYENDRA KUMAR, M.S.C., Extra Assistant Conservator of Forests. Clover Cot, Darjeeling.</b>
5 2-34	N	<b>Bates, WILLIAM HAYES, Ceramic Engineer, Burn &amp; Co., Ltd. Raniganj, Dt. Burdwan.</b>
7-7-09	N	<b>Bazaz, RANGNATH KHEMRAJ, Proprietor, Shri Venkateswar Press. 7th Khetwadi, Bombay No. 4.</b>
3-7-95	L	<b>Beatson-Bell, REV. SIR NICHOLAS DODD, K.C.S.I., K.C.I.E. Edgecliffe, St. Andrews, Scotland.</b>
7-5-34	R	<b>Bent, WILLIAM ANTONY, Assistant, Messrs. George Henderson &amp; Co., Ltd. 101/1, Clive Street, Calcutta.</b>
4-3-25	R	<b>Benthall, SIR EDWARD C, KT., Merchant. 37, Ballygunge Park, Calcutta.</b>
7-4-09	L	<b>*Bentley, CHARLES A., C.I.E., M.B., D.P.H., D.T.M. &amp; H., F.A.S.B., Professor of Hygiene. University of Egypt, Cairo.</b>
4-6-28	N	<b>Bhadra, SATYENDRA NATH, RAI BAHADUR, M.A., Principal, Jagannath Intermediate College. Nayabazar, Dacca.</b>
1-8-17	R	<b>*Bhandarkar, DEVADATTA RAMKRISHNA, M.A., PH.D., F.A.S.B. 10, Ritchie Road, Ballygunge, Calcutta.</b>
5-4-26	N	<b>Bhatia, M. L., M.S.C., Lecturer in Zoology. Lucknow University, Lucknow.</b>
4-11-08	R	<b>Bhattacharya, BISVESVAR, B.A., M.R.A.S. 16, Townshend Road, Bhawanipore, Calcutta.</b>
1-2-22	N	<b>Bhattacharya, VIDHUSHEKHARA, PANDIT, Principal, Vidyabhavana. Visvabharati, Santiniketan, Birbhum.</b>
7-7-24	L	<b>Bhattacharyya, BINOYTOSH, M.A., PH.D., Rajaratna, General Editor, Gaekwad's Oriental Series, and Librarian, Oriental Collections, Baroda State. Baroda.</b>

Date of Election.		
2-4-28	R	<b>Bhattacharyya</b> , NIBARAN CHANDRA, M.A., <i>Professor of Physiology, Presidency College</i> . 19, Hindusthan Road, Ballygunge, Calcutta.
4-6-28	N	<b>Bhattasali</b> , NALINI KANTA, M.A., PH.D., <i>Curator, Dacca Museum</i> . Ramna, Dacca.
6-4-31	R	<b>Bhose</b> , JOTISH CHANDER, M.A., B.L., <i>Advocate, Calcutta High Court</i> . 21A, Ray Bagan Street, Calcutta.
5-2-34	N	<b>Bhuyan</b> , SURYYA KUMAR, RAI BAHADUR, M.A., B.L., A.E.S., <i>Honorary Provincial Director of Historical and Antiquarian Studies, Assam; Professor, Cotton College</i> . Gauhati, Assam.
5-3-28	R	<b>Biswas</b> , CHARU CHANDRA, C.I.E., M.A., B.L., <i>Advocate, High Court</i> . 58, Puddopukur Road, P.O. Elgin Road, Calcutta.
1-8-23	R	<b>Biswas</b> , KALIPADA, M.A. <i>Royal Botanic Garden, Sibpur, Howrah.</i>
3-1-27	N	<b>Bivar</b> , HUGH GODFREY STUART, I.C.S., <i>District and Sessions Judge</i> . Murshidabad.
1-2-93	L	<b>*Bodding</b> , REV. P. O., M.A. (CHRIST.), F.A.S.B. <i>Gulleråsveien 27, Vettakollen, Oslo, Norway.</i>
4-11-35	A	<b>Bor</b> , N. L., M.A., D.S.C., F.L.S., I.F.S. <i>c/o The Conservator of Forests, Shillong, Assam.</i>
6-3-95	R	<b>*Bose</b> , SIR JAGADIS CHANDRA, KT., C.S.I., C.I.E., F.R.S., M.A., D.S.C., F.A.S.B. <i>Bose Institute</i> . 91, Upper Circular Road, Calcutta.
6-7-25	R	<b>Bose</b> , MANMATHA MOHAN, M.A., <i>Professor Emeritus, Scottish Church College</i> . 19, Gokul Mitra Lane, Hatkhola, Calcutta.
2-3-31	N	<b>Bose</b> , SUDHANSU KUMAR, B.S.C. (CAL.), A.R.S.M., B.S.C. (MINING) (LONDON), <i>Professor of Mining and Surveying</i> . Indian School of Mines, Dhanbad.
4-5-31	A	<b>Bottomley</b> , JOHN MELLOR, B.A. (OXON), I.E.S., <i>Director of Public Instruction, Bengal</i> . 1, Sunny Park, Ballygunge, Calcutta.
5-12-32	N	<b>Boyle</b> , CECIL ALEXANDER, MAJOR, D.S.O., <i>Adviser in Languages and Secretary to the Board of Examiners</i> . Army Headquarters, Simla.
3-12-34	R	<b>Brahmachari</b> , PHANINDRA NATH, M.S.C., M.B. 82/3, Cornwallis Street, Calcutta.
1-1-08	L	<b>*Brahmachari</b> , SIR UPENDRA NATH, KT., RAI BAHADUR, M.A., PH.D., M.D., F.S.M.F., F.A.S.B. 82/3, Cornwallis Street, Calcutta.
7-11-27	N	<b>Brahmachary</b> , SARAT CHANDRA, RAI BAHADUR, M.A., B.T. Kasba Road, Ballygunge, P.O. Dhakuria, 24-Pergs.
3-7-07	L	<b>*Brown</b> , JOHN COGGIN, O.B.E., D.S.C., F.G.S., M.I.M.E., M.INST.M.M., M.I.E. F.A.S.B. <i>c/o Messrs. Grindlay &amp; Co.</i> , 54, Parliament Street, Westminster, London, S.W.1.
6-10-09	R	<b>*Brown</b> , PERCY, A.R.C.A., F.A.S.B., <i>Curator, Victoria Memorial</i> . Calcutta.
8-1-96	F	<b>*Burn</b> , SIR RICHARD, KT., C.S.I., F.A.S.B. 9, Staverton Road, Oxford, England.
3-12-34	N	<b>Burt</b> , SIR BRYCE CHUDLEIGH, KT., C.I.E., M.B.E., B.S.C., I.A.S., <i>Agricultural Expert, Imperial Council of Agricultural Research</i> . 1, York Road, New Delhi.
2-4-13	R	<b>Calder</b> , CHARLES CUMMING, B.S.C., F.L.S., <i>Superintendent, Royal Botanic Garden</i> . Sibpur, Howrah.
4-11-29	R	<b>Campbell</b> , SIR GEORGE R., KT., <i>Partner, Messrs. Mackinnon Mackenzie &amp; Co</i> . 16, Strand Road, Calcutta.

Date of Election.		
7-2-27	R	Captain, DARA MANEKSHAW, <i>Merchant</i> . 1, Corporation Street, Calcutta.
1-9-20	R	Chakladar, HARAN CHANDRA, M.A. 28/4, Srimohan Lane, Kalighat, Calcutta.
7-3-32	R	Chakraborty, KHIRODE BEHARI, <i>Engineer and Manufacturer</i> . 7, Hindusthan Park, P.O. Ballygunge, Calcutta.
4-7-27	R	Chakravarti, CHINTAHARAN, M.A., <i>Lecturer, Bethune College</i> . 28/3, Sahanager Road, Kalighat, Calcutta.
3-2-30	N	Chakravarti, M. N., M.Sc., A.T.S. "Gitanjali". 15, Lodge Road, Lahore.
5-6-33	N	Chakravarti, SUSIL KUMAR, M.A., <i>Zemindar</i> . Cooch Behar (Cooch Behar State).
3-1-27	N	Chakravarty, NIRANJANPRASAD, M.A., PH.D. (CANTAB.), <i>Government Epigraphist</i> . Office of the Government Epigraphist, Ootacamund, Nilgiris, S. India.
6-1-30	A	Chakraverti, SHRISH CHANDRA, B.L., <i>Attorney-at-Law, High Court, Calcutta</i> . 2, Marquis Street, Calcutta.
1-9-20	R	*Chanda, RAMAPRASAD, RAI BAHADUR, B.A., F.A.S.B. P. 463, Manoharpukur Road, Kalighat, Calcutta.
3-1-06	L	Chapman, JOHN ALEXANDER, <i>Librarian, Rampur State Library</i> . Rampur.
7-5-28	R	Chatterjee, SIR NALINI RANJAN, ET., M.A., B.L., <i>Retired Judge and sometime acting Chief Justice, Calcutta</i> . 91A, Harish Mukerjee Road, Bhawanipore, Calcutta.
7-2-27	R	Chatterjee, ASHOKE, B.A. (CAL.), B.A. (CANTAB.), <i>Editor, "Welfare"</i> . 91, Upper Circular Road, Calcutta.
27-10-15	F	Chatterjee, SIR ATUL CHANDRA, K.C.I.E., K.C.S.I., <i>Late High Commissioner for India</i> . Withdean. Cavendish Road, Weybridge, Surrey, England.
1-10-20	R	Chatterjee, NIRMAL CHANDRA. 52, Haris Mukerjee Road, Bhawanipore, Calcutta.
4-7-27	R	Chatterjee, PATTIPABON. M.A., B.L., <i>Vakil, High Court</i> . 84, Harrison Road, Calcutta.
3-12-34	R	Chatterjee, SISIR CHANDRA, M.D. (EDIN.), M.R.C.P. (EDIN.), D.P.H. (EDIN.), <i>Chief Medical Officer, E.B. Ry.</i> 3, Koilaghat Street, Calcutta.
5-1-31	R	Chatterji, DURGACHARAN, M.A., <i>Lecturer in Sanskrit, Bethune College</i> . P. 317, Jatin Das Road, Kalighat, Calcutta.
4-6-34	N	Chatterji, BIJAN RAJ, PH.D. (London), D.LITT. (PUNJAB), <i>Professor of History, Meerut College</i> . Meerut.
7-5-28	R	Chatterji, KEDAR NATH, B.SC. (LONDON), A.E.C.S. (LONDON). 43, Wellesley Street, Calcutta.
7-6-11	R	Chatterji, KARUNA KUMAR, LT.-COL., I.T.F., M.C., V.H.A.S. 6/1, Wood Street, Calcutta.
6-8-24	R	Chatterji, SUNITI KUMAR, M.A. (CAL.), D.LIT. (LONDON), <i>Khaira Professor of Linguistics, Calcutta University</i> . "Sudharma", 16, Hindusthan Park, (off Rasbihari Avenue East End), Ballygunge, Calcutta.
5-11-24	R	Chattopadhyay, K. P., M.Sc., <i>Education Officer, Corporation of Calcutta</i> . 55/1, Old Ballygunge 1st Lane, Calcutta.
2-11-25	N	Chattopadhyaya, KSHETRESA CHANDRA, M.A., <i>Lecturer in Sanskrit</i> . Allahabad University, Allahabad.
1-4-14	R	Chaudhuri, GOPAL DAS. 32, Beadon Row, Calcutta.
6-12-26	R	Chokhani, SREENARAYAN, <i>Secretary, Shree Hanuman Pustakalaya</i> . 8, New Ghuseri Road, Salkea, Howrah.
5-12-23	R	Chopra, B. N., D.Sc., F.L.S., <i>Assistant Superintendent, Zoological Survey of India</i> . Indian Museum, Calcutta.

Date of Election.		
1-2-22	R	*Chopra, R. N., C.I.E., M.A., M.D. (CANTAB.), BREVET-COL., I.M.S., F.A.S.B., <i>Professor of Pharmacology</i> . School of Tropical Medicine and Hygiene, Chittaranjan Avenue, Calcutta.
5-11-28	R	Chopra, GOPICHAND. 47, Khangraputty, Calcutta.
5-12-27	L	Chowdhury, SIR CHHAJURAM, KT., C.I.E., M.L.C. 21, Belvedere Road, Calcutta.
2-4-28	R	Chowdhury, RAI JATINDRANATH, <i>Zemindar</i> . 36, Russa Road, Tollygunge, Calcutta.
3-7-07	L	*Christie, WILLIAM ALEXANDER KYNOCH, B.SC., PH.D., M.INST.M.M., F.A.S.B. c/o The Lloyds Bank, 6, Pall Mall, London, S. W. 1.
3-11-09	A	*Christophers, SIR SAMUEL RICKARD, KT., C.I.E., O.B.E., F.R.S., F.A.S.B., M.B., LT.-COL., I.M.S. 80, Onslow Gardens, South Kensington, London, S.W. 7.
1-9-15	R	Cleghorn, MAUDE LINA WEST (MISS), F.L.S., F.E.S. 43, Moulahat Road, Calcutta.
2-2-31	A	Clough, JOHN, <i>Barrister-at-Law</i> . 17, Store Road, Ballygunge, Calcutta.
4-2-35	N	Cookson, CHRISTOPHER ARTHUR, <i>Assistant, The Bombay Co., Ltd.</i> Delhi.
5-5-30	F	Cooper, G. A. P. 29, Eccleston Street, Eaton Square, London, S.W. 1.
3-9-34	R	Couchman, BRIGADIER HAROLD JOHN, D.S.O., M.C., <i>Surveyor-General of India</i> . Survey of India, 13, Wood Street, Calcutta.
6-11-33	R	Coulson, ARTHUR LENNOX, D.SC. (MELB.), D.I.C., F.G.S. Geological Survey of India, 27, Chowringhee, Calcutta.
4-11-29	L	*Cotter, GERALD DE PURCELL, B.A., SC.D. (DUBLIN), M.INST.M.M., F.G.S., F.A.S.B. "Fallowfield", Manor Road, Penn., Bucks., England.
5-3-34	R	Craddock, SIR WALTER MERRY, KT., D.S.O., COLONEL, M.C., <i>Stock Broker</i> . Bengal Club, Calcutta.
25-8-87	R	Criper, WILLIAM RISDON, F.C.S., F.I.C., A.R.S.M. Konnagar.
2-11-25	A	Crookshank, HENRY, B.A., B.A.I. (DUBLIN), <i>Assistant Superintendent, Geological Survey of India</i> . 27, Chowringhee, Calcutta.
7-3-32	R	Darbari, M. D., <i>Incorporated Accountant, S.B. Billimoria &amp; Co., Ltd.</i> 100, Clive Street, Calcutta.
4-3-25	R	Das, AJIT NATH, RAI BAHADUR, M.R.A.S., F.Z.S., <i>Zemindar</i> . 24, South Road, Entally, Calcutta.
3-12-24	R	Das, SURENDRA NATH, M.B., <i>Medical Practitioner</i> . 67, Nimala Ghat Street, Calcutta.
6-9-22	R	Das-Gupta, SURENDRA NATH, M.A., PH.D., I.E.S., <i>Principal, Sanskrit College</i> . 1, College Square, Calcutta.
1-3-26	R	Datta, HIRENDRA NATH, M.A., B.L., <i>Solicitor, High Court</i> . 139, Cornwallis Street, Calcutta.
3-6-25	N	Datta, S. K., B.A., M.B., CH.B. (EDIN.), <i>Principal, Forman Christian College</i> . Lahore.
4-6-34	R	Daver, NANABHOY SORABJI, B.A. (HONS.), <i>Mercantile</i> . c/o Parke, Davis & Co., 5, Dhurumtollah Street, Calcutta.
6-8-24	L	Davies, L. M., LT.-COL., LATE R.A., M.A., F.R.S.E., F.R.A.I., F.G.S. 8, Garscube Terrace, Murrayfield, Edinburgh, 12, Scotland.
4-3-29	R	De, J. C., M.B., LT.-COL., I.M.S., <i>Superintendent, Campbell Medical School</i> . 135, Lower Circular Road, Calcutta.

Date of Election.		
19-9-95	L	De, KIRAN CHANDRA, C.I.E., B.A., I.C.S. (RETD.), <i>Manager, Nawab Bahadur of Murshidabad Estates</i> . Lalbajh, Murshidabad.
5-12-32	N	Deb, SUSHIL KUMAR, B.A. Sheikghat, P.O. Sylhet, Dt. Assam.
5-12-27	L	Dechhen, H.H. MAHARANI KUNZANG, <i>Maharani of Sikkim</i> . Gangtok, Sikkim.
5-5-30	N	Deo, SIR PRATAP CHANDRA BHANJ, K.C.I.E., <i>Maharajah, Ruler of Mayurbhanj State</i> . P.O. Baripada, Mayurbhanj, B.N.R.
5-11-34	R	Dey, MUKUL, A.R.C.A. (LOND.), M.C.S.E. (U.S.A.), F.R.S.A., etc., <i>Principal, Govt. School of Art; Officer in charge, Art Section Keeper of Govt. Art Gallery; Trustee, Indian Museum</i> . 28, Chowringhee, Calcutta.
4-5-10	L	Dhavlé, THE HON'BLE MR. JUSTICE SHANKAR BALAJI, B.A., I.C.S., <i>Judge, Patna High Court</i> . Patna.
4-8-20	N	Dikshit, KASHINATH NARAYAN, M.A. c/o The Office of the Director-General of Archaeology, New Delhi.
5-1-98	R	Dods, WILLIAM KANE, <i>Agent, Hongkong and Shanghai Banking Corporation</i> . 6, Minto Park, Alipur, Calcutta.
2-2-31	A	Douglas, GORDON WATSON, B.SC., D.L.M., <i>State Chemist to the Government of Bhopal</i> . State Laboratory, Bhopal, Central India.
2-7-02	L	Doxey, FREDERICK. "Ballygunge". Cooden Drive, Bexhill-on-Sea, Sussex, England.
7-11-32	R	Driver, DARAB CURSETJI, M.A. (CANTAB.), <i>Barrister-at-Law, Constituted Attorney to Messrs. Tata &amp; Sons, Ltd., Managing Agents for The Tata Iron &amp; Steel Co., Ltd.</i> 71/73, Park Street, Calcutta.
7-5-34	R	Duncan, PERCIVAL CAIRNCROSS, <i>Mercantile Assistant with Messrs. George Henderson &amp; Co., Ltd.</i> 101/1, Clive Street, Calcutta.
1-7-29	A	Dunn, JOHN ALEXANDER, D.SC., D.I.C., F.G.S., <i>Assistant Superintendent, Geological Survey of India</i> . 27, Chowringhee, Calcutta.
2-1-33	N	Dutch, ROBERT AUSTEN, B.A. (CANTAB.), I.C.S., <i>District Magistrate</i> . Noakhali.
3-7-33	A	Dutt, GURU SADAY, <i>Barrister-at-Law</i> , I.C.S. 12, Loudon Street, Calcutta.
30-9-35	R	Dutt, MOHENDRA NATH, L.E., <i>Consulting Engineer</i> . 12, Kailas Bose Lane, Howrah.
5-12-32	R	Dutt, NALINAKSHA, M.A., PH.D., D.LITT. (LOND.), <i>Lecturer, Calcutta University</i> . 91-1B, Manicktollah Street, Calcutta.
5-3-28	A	Eberl, OTTO, DR. JUR., <i>Late Vice-Consul for Germany</i> . 2, Store Road, Ballygunge, Calcutta.
4-11-29	R	Edwards, L. BROOKE, <i>Manager in India, The Baldwin Loco. Works of Philadelphia, U.S.A.</i> 5, Dalhousie Square, Calcutta.
5-1-31	L	Evans, PERCY, B.A. (CANTAB.), F.G.S., <i>Geologist</i> . c/o The Burma Oil Co., Digboi, Assam.
6-2-28	L	Ezra, SIR DAVID, KT., F.Z.S., M.B.O.U. 3, Kyd Street, Calcutta.
2-12-29	N	Fawcus, LOUIS REGINALD, B.A. (CANTAB.), <i>Indian Civil Service, Magistrate and Collector</i> . Dacca.

Date of Election.		
3-8-04	R	*Fermor, SIR LEWIS LEIGH, KT., O.B.E., M.INST.M.M., D.SC., A.R.S.M., F.G.S., F.R.S., F.A.S.B., <i>Director, Geological Survey of India</i> , 27, Chowringhee, Calcutta.
31-10-06	F	Finlow, ROBERT STEEL, C.I.E., B.SC., F.I.C., <i>Late Director of Agriculture, Bengal.</i> c/o Messrs. Grindlay & Co., Ltd., 54, Parliament Street, London, S.W. 1.
4-1-26	F	Fleming, ANDREW. Post Box No. 2436, Johannesburg, S. Africa.
5-11-13	R	Fox, CYRIL S., D.SC. (BIRM.), M.I.M.E., F.G.S. <i>Geological Survey of India</i> , 27, Chowringhee, Calcutta.
2-4-19	A	Friel, RALPH, I.O.S., B.A., B.SC. (DUBLIN), J.P., <i>Deputy Commissioner, Assam.</i> Silchar, Assam.
7-3-27	F	Fukushima, NAOSHIRO. 33, Hikawacho, Akasaka, Tokyo, Japan.
5-11-28	R	Galstaun, JOHN CARAPIET, O.B.E., <i>Merchant and Landholder.</i> 234/4, Lower Circular Road, Calcutta.
1-11-26	R	Galstaun, SHANAZAN, M.A., D.M.R.E., M.R.C.S., L.R.C.P., <i>Medical Practitioner, Radiologist, Medical College Hospital.</i> 39, Theatre Road, Calcutta.
6-10-09	R	*Gangoly, ORDHENDRA COOMAR, B.A., F.A.S.B. 2, Asutosh Mukherjee Road, Calcutta.
5-11-34	R	Gee, EDWARD ROWLAND, M.A. (CANTAB.), F.G.S., <i>Assistant Superintendent, Geological Survey of India.</i> 27, Chowringhee, Calcutta.
2-1-33	R	George, JAMES, B.A. (CANTAB.), I.C.S., <i>Special Officer, Political Department, Govt. of Bengal.</i> United Service Club, Calcutta.
6-2-33	L	Ghatak, JYOTISH CHANDRA, M.A. (TRIPLE), SAHITYA SARASWATI, JYOTISH-SAGARA, <i>Professor.</i> 4, Boloram Bose Ghat Road, Bhawanipore, Calcutta.
7-5-28	R	Ghosal, UPENDRA NATH, M.A., PH.D., <i>Professor of History, Presidency College.</i> 12, Badur Bagan Row, Calcutta.
5-4-26	R	Ghose, BIMAL CHANDRA, <i>Barrister-at-Law.</i> 27/1, Harish Mukherjee Road, Calcutta.
1-4-29	R	Ghose, DEB PROSONNO, <i>Zemindar.</i> 75, Beadon Street, Calcutta.
7-1-29	R	Ghose, THE HON'BLE MR. JUSTICE MOHIM CHANDRA, B.A. (CAL.), M.A. (CANTAB.), I.O.S., <i>Barrister-at-Law (Inner Temple), Judge, High Court.</i> 4A, Little Russell Street, Calcutta.
3-12-24	R	Ghose, SUSHIL CHANDRA, B.A., <i>Deputy Magistrate.</i> 1, Sikdarbagan Street, Calcutta.
2-4-24	R	Ghosh, K., D.T.M., D.P.H. (CANTAB.), L.M.S., <i>Medical Practitioner.</i> 45, Creek Row, Calcutta.
7-3-27	R	Ghosh, PHANINDRA NATH, M.A., PH.D., SC.D. (PADUA), F.INST.P., <i>Sir Rashbehary Ghosh Professor of Applied Physics, University of Calcutta.</i> 92, Upper Circular Road, Calcutta.
4-9-12	R	Ghosh, TARAPADA, <i>Zemindar.</i> 14, Paddapukur Street, Kidderpore, Calcutta.
1-2-26	R	Ghuznavi, SIR ABDUL HALIM, KT., M.L.A., <i>Zemindar.</i> 18, Canal Street, Entally, Calcutta.
6-8-28	R	Ghuznavi, ISKANDER S.K., <i>Zemindar and Member, Advisory Board of Industries, Government of Bengal.</i> 45, Jhowtolla Road, Calcutta (and) Dilduar, Mymensingh.



Date of Election.		
1-2-26	R	<b>Ghuznavi, ALHADJ SIR ABDELKERIM ABU AHMED KHAN, KT., M.L.C., Zemindar of Dilduar. 45, Jhowtolla Road, Calcutta (and) North House, Dilduar, Mymensingh.</b>
3-12-34	R	<b>Gladstone, JOHN, Assistant, Messrs. Gillanders Arbuthnot &amp; Co., Ltd. 8, Clive Street, Calcutta.</b>
5-3-28	R	<b>Gooptu, DWIJENDRA NATH, Medical Practitioner and Landholder. 5, Middleton Street, Calcutta.</b>
7-9-10	N	<b>*Gravelly, FREDERIC HENRY, D.SC., F.A.S.B. Museum House, Egmore, Madras.</b>
5-12-00	L	<b>Grieve, JAMES WYNNDHAM ALLEYNE. c/o Messrs. Coutts &amp; Co., 440, Strand, London, W.C. 2.</b>
4-3-35	R	<b>Groth, EDWARD M., American Consul. American Consulate General, 9, Esplanade Mansions, Esplanade, Calcutta.</b>
4-2-25	R	<b>Guha, B. S., M.A., PH.D. (HARVARD). Indian Museum, Calcutta.</b>
6-12-26	R	<b>Guha, THE HON'BLE MR. JUSTICE SURENDRANATH, RAI BAHADUR. Judge, High Court. 20, Lansdowne Road, Calcutta.</b>
7-5-28	R	<b>Gupta, J. N., M.B.E., C.I.E., I.C.S., Late Member, Board of Revenue, Government of Bengal. 5, Riverside, Barrackpore.</b>
5-3-19	N	<b>Gupta, SIVAPRASAD. Seva Upavana, Benares City.</b>
5-8-15	R	<b>Gurner, CYRIL WALTER, B.A. (OXON), I.C.S., Chairman, Improvement Trust. 4, Theatre Road, Calcutta.</b>
6-3-01	N	<b>Habib-ur-RAHMAN, THE HON'BLE NAWAB SADR YAR JUNG, MAULANA, Rais, Bhikanpur. Habibganj, District Aligarh.</b>
5-2-34	R	<b>Haldar, BHARATI VIKAS, M.A., B.L., Advocate, High Court. 47, Haldarpura Road, Kalighat, Calcutta.</b>
6-1-30	R	<b>Haldar, SUDHINDRA KUMAR, M.A., I.C.S., Commissioner of Excise and Salt, Bengal. 241, Lower Circular Road, Calcutta.</b>
6-1-30	F	<b>Hamilton, SIR DANIEL MACKINNON, KT., Retired Partner, Messrs. Mackinnon Mackenzie &amp; Co. Balmacara, Rosshire, Scotland.</b>
2-4-24	R	<b>Haq, M. MAHFUZ-UL, M.A., Lecturer, Presidency College. 8/B, Dargah Road, Park Circus, Calcutta.</b>
1-5-12	R	<b>Harley, ALEXANDER HAMILTON, M.A., I.E.S., Principal, Islamia College. 19, Wellesley Square, Calcutta.</b>
1-2-26	F	<b>Harris, H. G. c/o Messrs. Martin &amp; Harris, Ltd., Rowlette Buildings, 17, Prinsep Street, Calcutta.</b>
2-4-28	R	<b>Harris, LAWRENCE ERNEST, Engineer, Manager for India, Messrs. Sulzer Brothers. 4, Lyons Range, Calcutta.</b>
5-11-19	N	<b>Hemraj, MANYABARA RAJ GURU, C.I.E., PANDITJI. Dhokatole, Nepal.</b>
3-2-30	F	<b>Henderson, ALEXANDER GAVIN, B.A. (OXON). Buscot Park, Faringdon, Berks, England.</b>
6-8-28	R	<b>Heron, A. M., D.SC. (EDIN.), F.G.S., F.R.G.S., F.R.S.E., Superintendent, Geological Survey of India. 27, Chowringhee, Calcutta.</b>
7-6-11	L	<b>*Hidāyat Hosain, MUHAMMAD, SHAMS 'UL-'ULAMA, KHAN BAHADUR, PH.D., F.A.S.B. 96/2c, Collin Street, Calcutta.</b>
1-2-26	A	<b>Hingston, H., LT.-COL., I.M.S., M.D., Late Surgeon to H.E. the Governor of Bengal. England.</b>
4-11-35	R	<b>Hirtzel, MICHAEL ARTHUR FREDERICK, B.A. (TRINITY COLLEGE, OXFORD), Mercantile Assistant, Macneill &amp; Co. 2, Fairlie Place, Calcutta.</b>

Date of Election.		
4-6-28	N	<b>Hobart, ROBERT CHARLES</b> , I.C.S. Commissioner's House, Gorakhpur, U.P.
1-4-25	R	<b>Hobbs, HENRY</b> , MAJOR, V.D., <i>Merchant</i> . 9, Old Court House Street, Calcutta.
1-2-32	R	<b>Holme, JAMES WILLIAM</b> , M.A., I.E.S. (RETD.), <i>Principal, La Martinière</i> . 11, Loudon Street, Calcutta.
7-3-27	N	<b>Hopkinson, ARTHUR JOHN</b> , I.C.S., <i>Secretary to the Government, N.-W.F. Province</i> . Peshawar, N.-W.F.P.
2-11-21	L	<b>*Hora, SUNDER LAL</b> , D.SC., F.Z.S., F.R.S.E., F.A.S.B. Zoological Survey of India, Indian Museum, Calcutta.
5-11-34	R	<b>Hosain, PRINCE AFSARUL MULUK MIRZA MUHAMMED AKRAM, BAHADUR</b> , <i>Political Pensioner and Landholder</i> . Afsar Manzil, 20, Ballygunge Circular Road, Calcutta.
6-6-23	L	<b>*Howard, SIR ALBERT</b> , KT., C.I.E., M.A., F.A.S.B., <i>Late Director, Institute of Plant Industry, Indore, and Late Agricultural Adviser to States in Central India</i> . 14, Liskcard Gardens, Blackheath, London, S.E. 3.
2-9-35	N	<b>Howland, FELIX</b> , <i>Professor of English</i> . Habibia College, Kabul, Afghanistan.
7-3-32	N	<b>Hughes, ARTHUR</b> , B.A. (MANCHESTER), <i>Indian Civil Service, Magistrate and Collector</i> , Murshidabad, Bengal.
6-8-34	N	<b>Husain, SYED ATA</b> , M.A. (CAL.), C.E. (ROORKEE), <i>RETIRED Superintending Engineer, Hyderabad State</i> . Mohalla Lingumpally, Hyderabad, Deccan.
6-6-23	N	<b>*Hutton, J. H.</b> , C.I.E., I.C.S., M.A., D.SC., F.A.S.B. Nowgong, Assam.
1-2-11	L	<b>Insch, JAMES</b> . 18, Beechwood Avenue, Boscombe, Hants, England.
4-3-35	R	<b>Jack, THE HON'BLE MR. JUSTICE ROBERT ERNEST</b> , I.C.S., <i>Judge, High Court</i> . United Service Club, Calcutta.
4-2-35	N	<b>Jaffar, S. M.</b> , B.A., <i>Author, Translator to the Judicial Commissioner, North-West Frontier Province</i> . 1508, Khudadad Street, Peshawar City, N.-W.F.P.
6-6-27	L	<b>Jain, BALDEODAS</b> , <i>Merchant and Banker</i> . 21, Armenian Street, Calcutta.
2-2-21	R	<b>Jain, CHHOTE LAL</b> , M.R.A.S. 25, Central Avenue North, Calcutta.
6-1-30	N	<b>Jain, NIRMAL KUMAR</b> . Devashrama, Arrah.
6-8-28	N	<b>Jaitly, P. L.</b> , <i>Electrical Engineer, Merchant</i> . 15, Canning Road, Allahabad.
1-11-26	F	<b>Jameson, THOMAS BLANDFORD</b> , MAJOR, M.C., M.A. (CANTAB.), I.C.S. Claremont, Kingskerswell, S. Devon, England.
4-11-29	F	<b>Jarvis, ROBERT Y.</b> The Department of State, Washington, District Columbia, U.S.A.
6-5-25	R	<b>Jatia, SIR ONKAR MULL</b> , KT., O.B.E., <i>Merchant</i> . 2, Rupchand Roy Street, Calcutta.
4-2-29	R	<b>Jenkins, WALTER ALLEN</b> , D.SC. (SHEFFIELD), I.E.S., <i>Principal, David Hare Training College</i> . United Service Club, Calcutta.
5-4-26	A	<b>Jones, THORNTON</b> , <i>Solicitor</i> . o/o Messrs. Morgan & Co., 1, Hastings Street, Calcutta.
1-11-11	L	<b>Kamaluddin AHMAD, SHAMS-UL-'ULAMĀ</b> , M.A., I.E.S., <i>Principal, Krishnagar College</i> . Krishnagar, Nadia.
5-3-24	R	<b>Kanjilal, M. N.</b> , M.A. (CAL.), LL.B. (CANTAB.), <i>Barrister-at-Law</i> . 17, Loudon Street, Calcutta.

Date of Election.		
3-12-34	N	Kapur, CHOONI LAL. Makermal Colliery, Mari Indus, Punjab.
6-11-33	R	Kavyatirtha, RAM DEAN, <i>Pundit</i> . 55, Surendranath Banerjee Road, Calcutta.
4-5-10	L	*Kemp, STANLEY W., B.A., D.S.O., F.R.S., F.A.S.B. 'Discovery Expedition,' 52, Queen Anne Chambers, Dean Farrar Street, London, S.W. 1.
2-5-30	N	Kenny, DICK EDWARD COURTENAY, LT.-COL., I.A., <i>Deputy Commissioner, Tavoy</i> . Burma.
2-12-29	N	Khan, MATIUR RAHMAN, <i>Khas Mahal Circle Officer</i> . 27, Panchbhaighat, Dacca.
3-12-24	R	Khan, REZAUR RAHMAN, M.A., B.L., <i>Deputy President, Bengal Legislative Council</i> . 28, Convent Road, Entally, Calcutta.
6-5-25	R	Khanna, VINAYEK LAL, M.B.A.S., <i>Merchant</i> . 137F, Balaram Dey Street, Beadon Street P.O., Calcutta.
2-8-26	R	Khettry, BENIMADHO, <i>Proprietor, Messrs. Gouri Shanker Khettry, Landholders, Bankers and Merchants</i> . 15, Paggiyapatti, Barabazar, Calcutta.
2-11-25	F	Kimura, R. (Ko-Shi), <i>Principal, College Department of Rishso University</i> . Osaki Machi, Tokyo, Japan.
5-2-34	N	Kirby, WALTER, B.S.C., <i>Inspector of Mines in India</i> . Dhanbad, E.I.R.
4-11-35	R	Klebe, ANINA, née BRANDT, PH.D. (GREIFSWALD, GERMANY), <i>Psychologist</i> . 14/1, Sudder Street, Calcutta.
7-7-20	R	*Knowles, ROBERT, C.I.E., M.B.C.S., L.R.C.P., B.A. (CANTAB.), F.A.S.B., LT.-COL., I.M.S. "Holmscroft", 2/1, Harrington Street, Calcutta.
6-5-25	F	Koester, DR. HANS, <i>Legations Sekretär</i> . Auswaertiges Amt, Abteilung W., Berlin W. 8, Wilhelmstrasse 75.
3-2-30	R	Korni, MICHAEL ALEXANDROWITZ (DR.), <i>Architect and Engineer, Messrs. Bird &amp; Co.</i> Chartered Bank Buildings, Clive Street, Calcutta.
1-3-26	R	Kramrisch, STELLA (MRS.), PH.D., <i>Lecturer in Ancient Indian History (Fine Arts), Calcutta University</i> . 57, Ballygunge Circular Road, Calcutta.
3-9-34	R	Krishnan, K. S., D.S.C., <i>Mahendralal Sircar Professor of Physics, Indian Association for the Cultivation of Science</i> . 210, Bowbazar Street, Calcutta.
6-11-33	A	Krishnan, M. S., M.A. (MADRAS), PH.D. (LOND.), A.B.O.S., D.I.C. (LOND.), <i>Assistant Superintendent, Geological Survey of India</i> . 27, Chowringhee, Calcutta.
2-4-28	R	Kumar, KUMAR KRISHNA, M.A., B.L., <i>Zemindar and Banker</i> . 31 & 31-1, Burtolla Street, Calcutta.
7-3-23	R	Labey, GEORGE THOMAS, M.C., <i>Bengal Pilot Service</i> . United Service Club, Calcutta.
4-2-35	R	Lal, RAM BIHARI, M.B., B.S., D.P.H., D.T.M. & H., D.B., <i>Professor of Vital Statistics and Epidemiology, All-India Institute of Hygiene and Public Health</i> . 21, Chittaranjan Avenue, Calcutta.
6-3-89	L	*La Touche, THOMAS HENRY DIGGES, M.A., F.G.S., F.A.S.B. 230, Hills Road, Cambridge, England.
5-2-34	R	LAW, BHABANI CHURN, <i>Merchant, Zamindar and Artist</i> . 223, Cornwallis Street, Calcutta.
5-8-14	L	LAW, BIMALA CHARAN, M.A., B.L., PH.D., F.R.HIST.S. 43, Kailas Bose Street, Calcutta.

Date of Election.		
1-2-11	R	Law, NARENDRA NATH, M.A., B.L., PH.D. 96, Amherst Street, Calcutta.
4-2-35	R	Law, PARBUTTY CHURN. 223, Cornwallis Street, Calcutta.
1-7-14	R	Law, SATYA CHURN, M.A., B.L., PH.D., F.Z.S., M.B.O.U. 50, Kailas Bose Street, Calcutta.
3-9-34	R	Ledrus, MICHAEL, <i>Professor in Divinity, Lecturer at the Gregorian University, Rome; Member of the Society of Jesus, Editor, 'The New Review'.</i> St. Xavier's College, 30, Park Street, Calcutta.
7-6-26	R	Lemmon, RICHARD DENNIS, <i>Merchant.</i> c/o Messrs. Martin & Harris Ltd., 17, Prinsep Street, Calcutta.
3-5-11	A	Lomax, C. E., M.A. La Martinière, 11, Loudon Street, Calcutta.
1-6-31	B	Lort-Williams, THE HON'BLE MR. JUSTICE JOHN, K.C., <i>Barrister-at-Law, Judge, High Court.</i> 227/1, Lower Circular Road, Calcutta.
5-7-26	A	Lyne, HOWARD WILLIAM, I.C.S. Khulna, E.B.R.
2-8-05	L	*McCay, DAVID, LT.-COL., I.M.S., M.D., B.CH., B.A.O., M.R.O.P., F.A.S.B. c/o The Standard Bank of S. Africa, Cradock, Cape Province, S. Africa.
1-3-26	R	McKay, JOHN WALLACE. c/o Messrs. Duncan Bros. & Co., Ltd., 101, Clive Street, Calcutta.
11-1-93	L	*MacLagan, SIR EDWARD DOUGLAS, K.C.S.I., K.C.I.E., F.A.S.B. 39, Egerton Terrace, London, S.W. 3.
5-3-24	R	McPherson, JAMES. c/o Messrs. Begg Dunlop & Co., Ltd., 2, Hare Street, Calcutta.
7-6-16	N	Mahajan, SURYA PRASAD. Murarpur, Gaya.
3-3-20	R	Mahalanobis, P. C., M.A., B.SC., I.E.S., <i>Professor, Presidency College.</i> 210, Cornwallis Street, Calcutta.
1-3-11	R	Mahtab, SIR BIJAY CHAND, K.C.S.I., I.O.M., MAHARAJA-DHIRAJA BAHADUR OF BURDWAN. 6, Alipur Lane, Calcutta.
3-2-30	N	Mahtab, UDAY CHAND, B.A., <i>Maharaj Kumar of Burdwan.</i> The Palace, Burdwan.
6-2-24	R	Mahindra, K. C., B.A. (CANTAB.). Messrs. Martin & Co., 12, Mission Row, Calcutta.
9-6-20	R	Majumdar, NANI GOPAL, M.A. <i>Archæological Survey of India, Indian Museum, Calcutta.</i>
2-2-16	R	Majumdar, NARENDRA KUMAR, M.A., <i>Professor, Calcutta University.</i> 3, Government Place, West, Calcutta.
4-6-13	N	Majumdar, RAMESH CHANDRA, M.A., PH.D., <i>Professor, Dacca University.</i> Ramna, Dacca.
5-5-30	A	Mallam, G. L., CAPTAIN, I.A., <i>Census Superintendent.</i> Peshawar, N.-W.F.P.
7-5-28	R	Mallick, SATYENDRA CHANDRA, M.A., I.C.S. (RETD.). 7-3, Burdwan Road, Alipur, Calcutta.
4-11-29	R	Mallya, BANTWAL GANAPATHY, MAJOR, I.M.S., F.R.C.S.E. <i>Civil Surgeon, Howrah</i>
6-2-18	L	*Manen, JOHAN VAN, C.I.E., <i>Officier de l'Instruction Publique,</i> F.A.S.B. 6, Temple Chambers, 6, Old Post Office Street, Calcutta.
5-6-01	F	Mann, HAROLD HART, D.SC., M.SC., F.I.C., F.L.S. <i>Woburn Experimental Station, Aspley Guise, Bedfordshire, England.</i>
6-1-30	N	Martin, M. F. C., CAPT., R.E. c/o The Garrison Engineer, Mingladon, Burma.

Date of Election.		
5-5-30	A	<b>Matthias, OWEN GARDINER</b> , <i>Managing Director, Messrs. Smith Stanistreet &amp; Co., Ltd. Stanistreet House, 18, Convent Road, Entally, Calcutta.</i>
2-1-28	N	<b>Mello, FROILANO DE, COLONEL</b> , <i>Director-General of Medical Services in Portuguese India, Professor of Parasitology. Nova Gôa.</i>
5-11-84	L	<b>*Middlemiss, CHARLES STEWART, C.I.E., F.R.S., B.A., F.G.S., F.A.S.B.</b> <i>Aviemore, Crowborough, Sussex, England.</i>
1-2-26	N	<b>*Mills, JAMES PHILIP, I.C.S., M.A. (OXON), J.P., F.A.S.B., Deputy Commissioner.</b> <i>Kohima, Naga Hills, Assam.</i>
5-6-12	N	<b>Misra, CHAMPA RAM, B.A., Rai Bahadur, Pandit, Diwan, Chhatarpur State.</b> <i>Bundelkhand, C.I.</i>
2-4-24	R	<b>Mitra, J. C., M.A., B.L., Retired Accountant-General, Bengal.</b> <i>1, Abinash Mitter Lane, Calcutta.</i>
5-3-24	R	<b>Mitter, THE HON'BLE SIR B. L., K.C.S.I., M.A., B.L., Barrister-at-Law, Member, Bengal Executive Council.</b> <i>5, Outram Street, Calcutta.</i>
5-3-24	R	<b>Mitter, THE HON'BLE MR. JUSTICE DWARKANATH, M.A., D.L., Judge, High Court.</b> <i>12, Theatre Road, Calcutta.</i>
4-3-29	R	<b>Mitter, HIRANYA KUMAR, Landholder.</b> <i>1, Jhamapukur Lane, Amherst Street P.O., Calcutta.</i>
5-4-26	R	<b>Mitter, KHAGENDRA NATH, RAI BAHADUR, M.A., Professor, Presidency College (Retired).</b> <i>72/1, Bondel Road, Ballygunge, Calcutta.</i>
30-9-35	R	<b>Mitter, SUDHIR CHUNDER, Barrister-at-Law.</b> <i>19, Camac Street, Calcutta.</i>
1-11-26	R	<b>Modi, JAL R. K., B.A.</b> <i>4, Camac Street, Calcutta.</i>
5-3-34	R	<b>Modi, JEHangIR JEEVANJI JAMSHEDJI, Merchant.</b> <i>5, Dhurruntollah Street, Calcutta.</i>
6-8-24	N	<b>Moloney, WILLIAM J., General Manager of Reuter's for the East.</b> <i>c o 26/7, Dalhousie Square, Calcutta.</i>
5-11-24	R	<b>Mookerjee, B. N., B.A. (CANTAB.), Engineer.</b> <i>12, Mission Row, Calcutta.</i>
3-5-98	L	<b>Mookerjee, SIR RAJENDRA NATH, K.C.I.E., K.C.V.O., HON. F.A.S.B.</b> <i>7, Harington Street, Calcutta.</i>
2-7-24	R	<b>Mookerjee, SYAMA PRASAD, M.A., B.L., Fakil, High Court, Vice-Chancellor, Calcutta University.</b> <i>77, Russa Road North, Calcutta.</i>
5-6-33	A	<b>Morris, C. J., Captain, Indian Army, 2/3rd Q.A.O. Gurkha Rifles.</b> <i>Razmak, Wazristan.</i>
2-5-32	F	<b>Muhammad, MIRZA, KHAN BAHADUR, C.I.E., LL.B., M.R.A.S., Advocate.</b> <i>Strand Road, Basrah.</i>
2-2-21	R	<b>Mukerjee, SUBODH CHANDRA, SHASTRI, M.A., DOCTEUR-ES-LETTRES (PARIS).</b> <i>3/1A, Raja Rajabullav Street, Calcutta.</i>
5-12-27	R	<b>Mukerjee, SUSIL KUMAR, F.R.C.S. (EDIN.), D.O. (OXON), D.O.M.S. (LOND.), Ophthalmic Surgeon, Carmichael Medical College Hospitals.</b> <i>1/1, Wood Street, Calcutta.</i>
6-2-28	R	<b>Mukerji, THE HON'BLE MR. JUSTICE MANMATHA NATH, ET., M.A., B.L., Judge, High Court.</b> <i>8/1, Harsi Street, Calcutta.</i>
3-3-30	N	<b>Mukharji, ISAN CHANDRA, Rai Bahadur, Tazimi Sardar and Retired Member of Jaipur Council.</b> <i>Jaipur, Rajputana.</i>
7-11-27	N	<b>Mukherjee, DEVAFROSANNA, M.A., B.L., Zemindar.</b> <i>Burdwan.</i>
2-8-26	R	<b>Mukherjee, JNANENDRA NATH, D.SC. (LONDON), F.C.S. (LONDON), Fellow of the Indian Chemical Society; Khaira Professor of Chemistry, University of Calcutta.</b> <i>92, Upper Circular Road, Calcutta.</i>

Date of Election.		
5-7-26	R	<b>Mukhopadhyaya</b> , PRABHAT KUMAR, M.A., <i>Research Assistant, Calcutta University</i> . 27, Govinda Ghosal Lane, Bhawanipore, Calcutta.
2-2-21	R	<b>Mukhopadhyaya</b> , RAMAPRASAD, M.A., B.L. 77, Russa Road North, Bhawanipore, Calcutta.
2-4-28	R	<b>Mullick</b> , KARTICK CHURN, KUMAR, <i>Director, Raja D. N. Mullick &amp; Sons, Ltd.</i> Colootola Rajbati, Chittaranjan Avenue, Calcutta.
6-8-34	R	<b>Mullick</b> , MANICK LALL, <i>Landholder; Honorary Magistrate, Sealdah</i> . 123, Grey Street, Calcutta.
4-3-29	R	<b>Mullick</b> , PRAMATHA NATH, RAI BAHADUR, <i>Zemindar and Landholder</i> . 129, Cornwallis Street, Calcutta.
7-5-28	N	<b>Murray</b> , EUGENE FLORIAN OLIPHANT, A.I.M.M., F.G.S., <i>Mining Geologist and Engineer</i> . Tatanagar, B.N.Ry.
1-6-21	N	<b>Muzammil-Ullah Khan</b> , THE HON'BLE NAWAB SIR MOHD., KHAN BAHADUR, K.C.I.E., O.B.E., K.B., LL.D., <i>Rais</i> . Bhikampur, Dt. Aligarh, U.P.
7-3-06	N	<b>Nahar</b> , PURAN CHAND, RAI BAHADUR, <i>Solicitor</i> . c/o 48, Indian Mirror Street, Calcutta.
5-12-27	L	<b>Namgyal</b> , H.H. MAHARAJA SIR TASHI, K.C.I.F., <i>Maharaja of Sikkim</i> Gangtok, Sikkim.
6-6-27	N	<b>Nandi</b> , MAHARAJA SRIS CHANDRA, M.A., M.L.C., <i>Zemindar</i> . Kasimbazar Rajbari, Kasimbazar, Murshidabad.
4-2-29	N	<b>Narain</b> , HIRDE, M.A., B.T., <i>Professor of History, Morris College</i> . Nagpur, C.P.
5-2-34	N	<b>Nariman</b> , RUSTOM, K., M.I.C.E., A.C.H., F.R.G.S. ( <i>Retired Superintending Engineer, Punjab Irrigation</i> ), <i>Professor of Engineering, Osmania University</i> . 'Gulistan', Sappers Lines, Secunderabad, Deccan.
5-3-28	R	<b>Neogi</b> , PANCHANAN, M.A., PH.D., I.E.S., <i>Professor of Chemistry, Presidency College</i> . 21, Kundu Lane, Belgachia, Calcutta.
3 11-30	A	<b>Newman</b> , CARL DAMIEN, M.B.B.S., D.T.M. & H., <i>District Medical Officer, E.B.Ry.</i> 2, Belvedere Park, Alipur, Calcutta.
3-12-24	N	<b>Newman</b> , CHAS F., F.R.G.S., M.R.S.T., M.C.P. Ramnagar, Benares.
7-4-15	F	<b>Ohtani</b> , COUNT KOZUI. San-ya-so, Edomachi, Fushimi, Kyoto, Japan.
5-11-28	R	<b>Olpadvala</b> , E. S. 52, Chowringhee, Calcutta.
3-9-34	R	<b>Ow-Wachendorf</b> , BARON W., <i>German Consul General, Minister Plenipotentiary</i> . German Consulate General, 26, Lee Road, Calcutta.
5-12-23	N	<b>Pande</b> , SHIVA BANDHAN, <i>Retired Tahsildar and Zemindar</i> . Ramaipatti, Mirzapur, U.P.
5-4-26	R	<b>Parker</b> , RICHARD HENRY, I.C.S., <i>Late Scholar of St. John's College, Oxford; Workmen's Compensation Commissioner</i> . Writer's Building, Calcutta.
4-11-29	F	<b>Parry</b> , NEVILL EDWARD, I.C.S. (RETD.). Coombe Fishaere House, Ipplefen, Newton Abbot, S. Devon, England.
5-2-34	R	<b>Pasricha</b> , CHIRANJI LAL, M.A., M.B., B.CHIR. (CANTAB.), M.R.C.S. (ENG.), L.R.C.P. (LOND.), CAPTAIN, I.M.S., <i>Professor of Pathology, Bacteriology and Helminthology, School of Tropical Medicine and Hygiene</i> . 11, Rowland Road, Calcutta.

Date of Election.		
6-5-29	F	Pawsey, C. R., <i>Indian Civil Service</i> . c/o The Lloyds Bank, 6, Pall Mall, London, S.W. 1.
6-6-88	L	Pennell, AUBRAY PERCIVAL, B.A., <i>Barrister-at-Law</i> . Lamb's Building, Temple, London, E.C. 4.
5-2-34	N	Percival, FREDERICK GEORGE, PH.D. (LOND.), F.G.S., <i>General Superintendent, Ore Mines and Quarries, Tata Iron and Steel Co.</i> Jamshedpur.
1-4-25	R	Perier, FERDINAND, S.J., <i>Most Reverend the Archbishop of Calcutta</i> . 32, Park Street, Calcutta.
7-4-30	A	Pesseln, REV. J. F., <i>Catholic Missionary, Superior of the Catholic Missionary Sanatorium</i> . Wellington, Nilgiris.
3-2-30	A	Pettigrew, REV. WILLIAM, <i>Missionary</i> . American Baptist Foreign Mission Society, P.O. Kangpokpi, Manipur, Assam.
6-4-31	N	Prasad, SHARDA. c/o Messrs. Gopinath Lal Behari, Satna.
3-4-18	L	*Prashad, BAINI, D.SC., F.Z.S., F.R.S.E., F.A.S.B., <i>Director, Zoological Survey of India</i> . Indian Museum, Calcutta.
3-8-25	N	Pruthi, HEM SINGH, M.SC. (PUNJAB), PH.D. (LONDON), <i>Imperial Entomologist, Imperial Institute of Agricultural Research</i> . Pusa, Darbhanga.
3-12-24	R	Pushong, E. S., M.D., L.S.A., <i>Medical Practitioner</i> . 1, Chapel Road, Hastings, Calcutta.
3-11-30	R	Rahman, SHAH KALIMUR, M.A., <i>Lecturer in Arabic and Persian, Calcutta University</i> . 51, Baitakhana Road, Calcutta.
6-8-34	R	Rao, U. SHANKER, <i>Bengal Pilot Service</i> . 83, Chowringhee, Calcutta.
1-2-26	N	Rao, Y. RAMACHANDRA, RAO SAHIB, M.A., F.E.S., <i>Locust Research Entomologist</i> . McLeod Road, Karachi.
2-7-24	N	Ray, ABINASH CHANDRA, B.A. R.M.H.E. School, P.O. Baidyabati.
7-9-21	R	Ray, HEM CHANDRA, M.A., PH.D. (LONDON). P. 39A, Manicktollah Spur, Calcutta.
5-1-21	N	Ray, JAGADISNATH, MAHARAJA, <i>Maharaja of Dinajpore</i> . Dinajpore.
5-3-90	R	*Ray, SIR PROFULLA CHANDRA, KT., C.I.E., D.SC., F.A.S.B. University College of Science, 92, Upper Circular Road, Calcutta.
5-11-28	L	Reinhart, WERNER, <i>Merchant</i> . c/o Messrs. Volkart Bros., Rychenberg, Winterthur, Switzerland.
6-2-28	R	Reneman, NICO., Kian Gwan Co. (India), Ltd., 4, Lyons Range, Calcutta.
2-4-24	F	Richards, F. J., I.C.S. 6, Lexham Gardens, London, W. 8.
5-2-34	R	Richter, HERBERT, DR. JUR., <i>Vice-Consul for Germany</i> . 26, Lee Road, Calcutta.
1-4-29	A	Rizvi, SYED HAMID HUSAIN, <i>Excise Sub-Inspector</i> . Mohalla Sanechri, Near Musjid of Munshi Sk. Ghassu, Saugor, C.P.
3-12-24	L	Roerich, GEORGE NICHOLAS, M.A., M.E.A.S., <i>Orientalist</i> . 310, Riverside Drive, New York, U.S.A. ("Urusvati" Naggar, Kulu, Punjab).
2-7-28	L	Roerich, NICHOLAS, <i>Professor, Honorary President, Master Institute of United Arts, New York, U.S.A., Artist-Painter</i> . 310, Riverside Drive, New York, U.S.A.
3-12-24	N	Rogers, T. E., <i>Tea Planter</i> . The Tyroom Tea Co., Ltd., Kharikatia, Assam.

Date of Election.		
4-12-01	F	*Ross, SIR EDWARD DENISON, KT., C.I.E., PH.D., F.A.S.B., <i>Director, School of Oriental Studies.</i> Finsbury Circus, London, E.C. 2.
5-6-33	R	Rossetti, FELIX FRANCIS LEO, <i>Secretary, Y.M.C.A.</i> 42, Corporation Street, Calcutta.
6-12-26	R	Roy, A. K., <i>Barrister-at-Law, Advocate-General, Bengal.</i> 3, Upper Wood Street, P.O. Theatre Road, Calcutta.
1-12-30	N	Roy, KUMAR KAMALRANJAN, B.A., <i>Zemindar.</i> Kashim-bazar Post, Dt. Murshidabad.
4-3-35	R	Roy, SAILESWAR SINGH, <i>Landholder.</i> 15, Lansdowne Road, Calcutta.
6-8-24	N	Roy-Chowdhury, BRAJENDRA KISHORE, <i>Zemindar.</i> (53, Sukea Street, Calcutta.) Gauripur, Mymensingh.
7-5-28	N	*Saha, MEGH NAD, D.SC., F.R.S., F.A.S.B., <i>Professor of Physics, University of Allahabad.</i> Katra, Allahabad.
5-11-24	N	*Sahni, B., M.A., SC.D. (CANTAB.), D.SC., F.G.S., F.A.S.B., <i>Professor of Botany.</i> The University, Lucknow.
5-2-34	L	Sale, HAROLD MONTAGUE, M.A., F.G.S., <i>Geologist, Burmah Oil Co., Ltd.</i> c/o Burmah Oil Co., Ltd., Digboi, Assam.
3-12-24	R	Sarkar, C. K., C.E., <i>Engineer and Architect.</i> 10, Hastings Street, Calcutta.
4-2-35	R	Sarkar, NALINI RANJAN. Hindusthan Buildings, Corporation Street, Calcutta.
4-2-35	N	Sayeeduddin, MOHAMMED, B.SC., M.A. (EDIN.), F.R.M.S., F.F.S.C., <i>Professor of Botany, Osmania University.</i> Hyderabad, Deccan.
6-3-33	R	Seal, SATIS CHANDRA, M.A., B.L., <i>Honorary Secretary, Indian Research Institute.</i> 55, Upper Chitpore Road, Calcutta.
5-2-34	R	Selzam, EDWART VON, <i>German Diplomatic Service, Consulate-General for Germany.</i> 26, Lee Road, Calcutta.
1-4-25	R	Sen, BENOY CHANDRA, M.A. 'Rupeswar', Diamond Harbour Road, Behala.
3-12-24	R	Sen, H. K., M.A., D.SC. (LONDON), D.I.C., <i>Professor of Chemistry, University College of Science.</i> 92, Upper Circular Road, Calcutta.
5-12-23	L	Sen, LAKSHMAN. H.H. RAJA OF SUKET. Suket State, Punjab.
1-4-29	R	Sen-Gupta, NARES CHANDRA, M.A., D.L., <i>Advocate, High Court.</i> 36, Girish Mukherjee Road, Bhawanipore, Calcutta.
5-4-26	R	Senior-White, RONALD, F.E.S., F.R.S.T.M. & H., <i>Malariaologist.</i> 5, Godfrey Mansions, Garden Reach, Calcutta.
1-12-07	R	Seth, MESROBE JACOB, M.R.A.S., M.S.A., F.R.S.A., <i>Examiner in Classical Armenian to the Calcutta University.</i> 9, Marsden Street, Upper Flat, Calcutta.
5-7-11	L	*Sewell, ROBERT BERESFORD SEYMOUR, C.I.E., M.A., SC.D. (CANTAB.), M.R.C.S., L.R.C.P., F.Z.S., F.L.S., F.R.S., F.A.S.B., LT.-COL., I.M.S., <i>Late Director, Zoological Survey of India.</i> 18, Barrow Road, Cambridge, England.
2-11-25	A	Sharif, MOHAMMAD, D.SC., F.R.M.S., F.L.S., <i>Lecturer in Zoology.</i> Muslim University, Aligarh.
6-5-29	N	Sharma, SRI RAM, M.A., M.R.A.S., M.A.O.S., <i>Professor of History.</i> D.A.V. College, Lahore.



Date of Election.	
5-8-35	R Shattock, JOHN SWITHIN HARVEY, B.A. (Oxon.), I.C.S., <i>Assistant Private Secretary to His Excellency the Governor of Bengal.</i> Government House, Calcutta.
2-5-23	N Shebbeare, E. O., <i>Conservator of Forests.</i> Darjeeling.
6-1-09	N Shirreff, ALEXANDER GRIERSON, B.A., I.C.S. <i>Commissioner,</i> Gorakhpur. U.P.
4-1-26	N Shortt, H. E., LT.-COL., I.M.S., <i>Director, King's Institute,</i> Guindy. Madras.
5-1-31	N Shukla, JAGANNATH PRASAD. Trans Gomti Outram Road, near Badshahnagar Railway Station, Lucknow.
6-2-28	L Shumser JUNG BAHADUR RANA, SIR KAISER, K.B.E., SUPRADIPTA MANYAVARA, LIEUT.-GENERAL, <i>Nepalese Army.</i> Kaiser Mahal, Kathmandu, Nepal.
5-2-02	N Shyam Lal, LALA, M.A., LL.B. Nawabganj. Cawnpore, U.P.
4-11-29	R Siddiqi, MOHAMMAD ZUBAYR, M.A., PH.D., <i>Sir Asutosh Professor of Islamic Culture, Calcutta University.</i> P. 274, Bright Street, Park Circus, Calcutta.
5-3-13	L *Simonsen, JOHN LIONEL, D.SC., F.I.C., F.A.S.B. University College of North Wales, Bangor, North Wales.
6-2-18	N Singh, MANYABARA BADA KAJI MARICHI MAN, PANDITJI, C.I.E. 38, Khichapokhari, Kathmandu, Nepal.
4-11-29	F Singh, JAIPAL, M.A. ( <i>Modern Greats</i> ), <i>St. John's College, Oxford University.</i> Achimota College, Accra, West Africa.
5-3-34	L Singh, HIS HIGHNESS THE HON'BLE MAHARAJADHIRAJA SIR KAMESWAR, K.C.I.E. Darbhanga.
2-1-33	N Singh, RUDRA PERTAB, RAO BAHADUR, <i>Proprietor, Sonbarsa Raj.</i> Sonbarsa P.O., District Bhagalpore.
4-2-35	N Singh, SARABJIT, M.A., B.L. P.O. Imphal, Manipur State.
3-6-35	R Singhania, RAGHUNATH PRASAD, VIDYABHUSAN-VISARAD, <i>Secretary, Rajasthan Research Society.</i> 27, Baranoshi Ghose Street, Simla, Calcutta.
5-9-12	R Singhi, BAHADUR SINGH. (Azimganj, Murshidabad.) 48, Gariahat Road, Calcutta.
7-8-33	N Sinh, RAGHUBIR, RAJKUMAR, M.A., LL.B., <i>Heir-Apparent of Sitamau State.</i> Raghupir Niwas, Sitamau, C.I.
7-5-28	F Sinha, LORD, OF RAIPUR. Queen Anne Mansions, St. James' Park, London.
6-6-27	N Sinha, SHEONANDAN PRASAD, M.B., <i>Assistant Surgeon.</i> Government Hospital, Jamshedpur.
6-2-28	R Sinha, SUHRID CHANDRA, KUMAR, M.SC. 18, Ananda Lane, P.O. Shambazar, Calcutta.
4-1-26	N Sinton, J. A., O.B.E., LT.-COL., I.M.S., V.C., <i>Officer-in-Charge, Malaria Bureau.</i> Central Research Institute, Kasauli.
5-7-16	L Sircar, GANAPATI, VIDYARATNA. 69, Beliaghata Main Road, Calcutta.
5-3-24	N Sircar, THE HON'BLE SIR NRIPENDRA NATH, K.C.S.I., KT., M.A., B.L., <i>Barrister-at-Law, Law Member, H.E. The Viceroy's Executive Council.</i> New Delhi.
5-3-24	R Sircar, SIR NIL RATAN, KT., M.A., M.D., <i>Physician.</i> 7, Short Street, Calcutta.
7-11-32	N Sitling, G. T. The Ong Press, Kalimpong, D.H. Ry.
5-8-29	R Sommerfeld, ALFRED, <i>Merchant.</i> c/o Mousell & Co., Mercantile Buildings, Lall Bazar, Calcutta.
3-9-34	R Sondhi, VED PALL, M.SC., F.O.S., <i>Assistant Superintendent, Geological Survey of India.</i> 27, Chowringhee, Calcutta.

Date of Election.		
7-3-27	R	<b>Stagg, M.</b> , LT.-COL., R.E., O.B.E., <i>Master, H.M.'s Mint, 47, Strand Road, Calcutta.</i>
7-3-23	F	<b>Stamp, L. DUDLEY, B.A.</b> , D.S.C. <i>University of London, London School of Economics, Houghton Street, London, W.C. 2.</i>
4-1-26	N	<b>Stapleton, GRACE (MISS)</b> , M.D., B.S. (LONDON). <i>Dufferin Hospital, Delhi.</i>
28-9-04	L	<b>*Stapleton, HENRY ERNEST, M.A.</b> , B.S.C., I.E.S., F.A.S.B., <i>Late Director of Public Instruction, Bengal. St. Brelade, Jersey, C.I, England.</i>
5-11-28	N	<b>Statham, R. M.</b> , C.I.E., B.A., I.E.S., <i>Educational Commissioner with the Government of India. New Delhi.</i>
6-5-25	R	<b>Staub, MAX</b> , <i>Consul for Switzerland. 100, Clive Street, Calcutta.</i>
1-11-22	A	<b>Strickland-Anderson (Mrs.)</b> , 1, Alipur Park, Calcutta.
2-6-20	R	<b>Suhrawardy, SIR HASSAN, O.B.E.</b> , LT.-COL., KT., M.D., F.R.C.S.I., D.P.H., <i>Chief Medical Officer, E.B. Ry., late Vice-Chancellor, Calcutta University. 3, Suhrawardy Avenue, Park Circus, Calcutta.</i>
3-3-20	N	<b>Sundararaj, BUNGURU, M.A.</b> , PH.D., <i>Director of Fisheries. Chepauk, Madras.</i>
7-11-32	L	<b>Suvarna, SHUMSER JUNG BAHADUR RANA</b> , <i>Major-General in the Nepalese Army. Singha Darbar, Kathmandu, Nepal.</i>
6-4-98	R	<b>Tagore, SIR PRADYOT COOMAR, KT.</b> , MAHARAJA BAHADUR. "Tagore Castle", 12, Prasanna Coomar Tagore Street, Calcutta.
7-11-27	R	<b>Tarkatirtha, BIMALANANDA</b> , <i>Kaviraj, Punditbhusan, Byakarnatirtha. 90 3, Grey Street, Calcutta.</i>
31-8-93	L	<b>Tate, GEORGE PASSMAN</b> , 56, Cantonment, Bareilly, U.P.
2-5-32	R	<b>Thakur, AMARESWAR, M.A.</b> , PH.D., <i>Lecturer, Calcutta University, Hon. Secretary, Sanskrit Publication Department, Metropolitan Printing and Publishing House. 29, Sadananda Road, P.O. Kalighat, Calcutta.</i>
2-12-29	A	<b>Thomas, H. W.</b> , F.C.S., M.P.S., <i>Senior Partner and Chairman of the Managing Directors, Messrs. Smith Stanistreet &amp; Co. Stanistreet House. 18, Convent Road, Entally, Calcutta.</i>
1-6-04	L	<b>*Tipper, GEORGE HOWLETT, M.A.</b> , F.G.S., M.INST.M.M., F.A.S.B. "The Laurels", Glebe Road, Cambridge, England.
4-3-29	A	<b>Travers, SIR WALTER LANCELOT, KT.</b> , C.I.E., O.B.E., M.L.C., <i>Tea Planter, Baradighi Tea Estate. Baradighi P.O., B.D.R., Jalpaiguri.</i>
7-5-28	F	<b>Tucci, GIUSEPPE, PH.D.</b> , <i>Late Professor of Religions and Philosophy of India and the Far East. University of Rome; Professor of Chinese, University of Naples. Naples, Italy.</i>
5-7-26	A	<b>Tyson, JOHN DAWSON, C.B.E.</b> , M.A. (OXON), I.C.S., J.P., <i>Late Private Secretary to H.E. the Governor of Bengal. Government House, Calcutta.</i>
3-9-34	R	<b>Ulser, M. E. M. M.</b> , <i>Consul General for Belgium. 9, Pretoria Street, Calcutta.</i>
6-8-28	N	<b>Urchs, OSWALD, M.D.</b> c/o Messrs. Haverro Trading Co., Ltd., Post Box 642, Bombay.
7-3-27	R	<b>Urquhart, REV. W. S.</b> , M.A., D.D., D.LITT., <i>Principal, Scottish Church College, and Late Vice-Chancellor, Calcutta University. 3 &amp; 4, Cornwallis Square, Calcutta.</i>

Date of  
Election.

- 4-7-27 N Vance, R. L., M.B., B.O.H., B.A.O. (DUB.), L.M. (ROT.), MAJOR, I.M.S., *Officiating Chief Medical Officer, Western India States Agency*. Rajkot, Kathiawar.
- 7-8-33 R Vedantatirtha, VANAMALI, M.A., *Formerly Professor, Cotton College, Gauhati*. 8/4-E, Nepal Bhattacharya Lane, Kalighat, Calcutta.
- 6-6-32 R Vere-Hodge, Mrs. E. H., *Author*. 9/4, Middleton Row, Calcutta.
- 5-7-05 R Vidyabhushan, AMULYA CHARAN. Vangiya Mahakosha, 5, Jadu Mitter Lane (North), Shambazar, Calcutta.
- 1-2-32 R Visser, DR. PH. C., *Consul-General for the Netherlands*. E-1, Clive Buildings, Clive Street, Calcutta.
- 6-3-01 L \*Vogel, JEAN PHILIPPE, LITT.D., F.A.S.B. Noordeindsplein, 4a, Lieden, Holland.
- 27-9-34 L Vost, WILLIAM, LT.-COL., I.M.S. Leicester Lodge, 1, Medina Villas, Hove, Sussex, England.
- 6-5-25 R \*Wadia, D. N., M.A., B.SC., F.R.G.S., F.A.S.B., *Geological Survey of India*. 27, Chowringhee, Calcutta.
- 5-3-28 A Waight, HARRY GEORGE, B.A. (OXON. and LOND.), F.R.G.S., I.C.S., *District and Sessions Judge*. Burdwan.
- 2-5-27 A Watson, SIR ALFRED HENRY, KT., *Late Editor, The "Statesman"*, Calcutta. England.
- 2-2-31 A Wauchope, R. S., O.B.E., A.I.C.E., F.R.A.I., MAJOR, I.A. 8, Park Chambers, 93, Park Street, Calcutta.
- 6-2-33 N Wellsted, THOMAS ARTHUR, A.R.S.M., B.SC., ASSOC. INST. M.M., *Mining Engineer*. Mansar, P.O. Kandri, Ramtek, C.P.
- 6-2-33 R West, WILLIAM DIXON, M.A. (CANTAB.), *Assistant Superintendent, Geological Survey of India*. 27, Chowringhee, Calcutta.
- 1-11-26 R Westcott, FOSS, MOST REVEREND, D.D. (CANTAB.), HONORARY D.D. (OXON), *Lord Bishop of Calcutta and Metropolitan of India, Burma and Ceylon* Bishop's House, 51, Chowringhee, Calcutta.
- 19-9-06 L \*Whitehead, RICHARD BERTRAM, F.A.S.B., I.O.S. (RETD.). 30, Millington Road, Cambridge, England.
- 6-5-29 A Williams, HENRY FRENCH FULFORD, M.A., CLARE COLLEGE (CAMB.), *Chaplain of Barrackpore*. Barrackpore.
- 6-2-28 F Williams, T. TALIESIN, M.A., B.SC. 2, Orchard, Welwyn Garden City, Herts., England.
- 3-2-34 R Wilson, HARRY ELLIS CHASLER, M.B., CH.B., D.S., *Professor of Biochemistry and Nutrition, All-India Institute of Hygiene and Public Health*. U.S. Club, Calcutta.
- 7-3-06 L \*Woolner, ALFRED COOPER, C.I.E., M.A., D.LITT. (Hon.), F.A.S.B., *Vice-Chancellor, Punjab University*. 53, Lawrence Road, Lahore.
- 1-4-08 R Wordsworth, WILLIAM CHRISTOPHER, M.A., I.E.S. (RETD.). c/o The "Statesman", Chowringhee Square, Calcutta.
- 7-3-27 N Wright, FREDERIC MAITLAND, *Broker*. Post Box No. 72, Bombay.
- 5-2-19 N \*Yazdani, GHULAM, M.A., F.A.S.B., *Epigraphist to the Government of India for Persian and Arabic Inscriptions, Hyderabad*. Archaeological Survey, Hyderabad, Deccan.

# ORDINARY MEMBERS.

(Chronological.)

1884.				1905.			
Nov.	5.	Middlemiss, C. S.		July	5.	Vidyabhusana, A. C.	
1887.				Aug.	2.	McCay, D.	
Aug.	25.	Criper, W. R.		1906.			
1888.				Jan.	3.	Chapman, J. A.	30
June	6.	Pennell, A. P.		Mar.	7.	Nahar, P. C.	
1889.				"	"	Woolner, A. C.	
Mar.	6.	La Touche, T. H. D.		Sept.	19.	Whitehead, R. B.	
1890.				Oct.	31.	Finlow, R. S.	
5 Mar.	5.	Ray, Sir Prafulla C.		1907.			
				July	3.	Brown, J. C.	35
				"	"	Christie, W. A. K.	
1892.				1908.			
Jan.	11.	MacLagan, Sir Edward D.		Jan.	1.	Brahmachari, Sir U. N.	
Feb.	1.	Bodding, P. O.		April	1.	Wordsworth, W. C.	
1893.				Nov.	4.	Bhattacharji, B.	
Aug.	31.	Tate, G. Passman		1909.			
1894.				Jan.	6.	Shirreff, A. G.	40
Sept.	27.	Vost, W.		April	7.	Bentley, C. A.	
1895.				July	7.	Bazaz, R. K.	
10 Mar.	6.	Bose, Sir Jagadis C.		Oct.	6.	Brown, P.	
July	3.	Beatson-Bell, Sir Nicholas D.		"	"	Gangoli, O. C.	
Sept.	19.	De, K. C.		Nov.	3.	Christophers, Sir S. R.	45
1896.				1910.			
Jan.	8.	Burn, Sir Richard		May	4.	Dhavlé, S. B.	
1897.				"	"	Kemp, S. W.	
Dec.	1.	Seth, M. J.		Sept.	7.	Gravely, F. H.	
1898.							
15 Jan.	5.	Dods, W. K.		1911.			
April	6.	Tagore, Sir Pradyot C.		Feb.	1.	Insch, J.	
May	4.	Mookerjee, Sir R. N.		"	"	Law, N. N.	50
1900.				Mar.	1.	Mahtab, Sir Bijay Chand	
Dec.	5.	Grieve, J. W. A.		May	3.	Lomax, C. E.	
				June	7.	Chatterjee, K. K.	
1901.				"	"	Hosain, M. H.	
Mar.	6.	Habib-ur-Rahman.		July	5.	Sewell, R. B. S.	55
20 "	"	Vogel, J. P.		Nov.	1.	Ahmed, K.	
June	5.	Mann, H. H.					
Dec.	4.	Ross, Sir Edward D.		1912.			
1902.				May	1.	Harley, A. H.	
Feb.	5.	Shyam Lal.		June	5.	Misra, C.	
July	2.	Doxey, F.		July	3.	Andrews, E. A.	
1904.				Sept.	4.	Ghosh, T.	60
25 June	1.	Tipper, G. H.		"	"	Singhi, B. S.	
Aug.	3.	Fernor, Sir L. L.					
"	"	Stapleton, H. E.					

## 1913.

	Mar.	5.	Simonsen, J. L.
	April	2.	Calder, C. C.
	June	4.	Majumdar, R. C.
65	Nov.	5.	Fox, C. S.

## 1914.

	Mar.	4.	Bacot, J.
	April	1.	Chaudhuri, G. D.
	July	1.	Law, S. C.
	Aug.	5.	Law, B. C.

## 1915.

70	April	7.	Ohtani, Count K.
	Aug.	4.	Gurner, C. W.
	Sept.	1.	Cleghorn, M. L. W.
	Oct.	27.	Chatterjee, Sir A. C.

## 1916.

	Feb.	2.	Majumdar, N. K.
75	June	7.	Mahajan, S. P.
	July	5.	Sarkar, G.

## 1917.

	April	4.	Awati, P. R.
	"	"	Aiyangar, K. V. R.
	Aug.	1.	Bhandarkar, D. R.

## 1918.

80	Feb.	6.	Banerji, N. N.
	"	"	Manen, Johan van
	"	"	Singh, B. M.
	April	3.	Prashad, B.

## 1919.

	Feb.	5.	Yazdani, G.
85	Mar.	5.	Gupta, S. P.
	April	2.	Friel, R.
	Nov.	5.	Hemraj, R.

## 1920.

	Mar.	3.	Mahalanobis, P. C.
	"	"	Sundara Raj, B.
90	June	2.	Suhrawardy, Sir H.
	"	"	Majumdar, N. G.
	July	7.	Knowles, R.
	Aug.	4.	Dikshit, K. N.
	Sept.	1.	Chakladar, H. C.
95	"	"	Chanda, R. P.
	"	"	Chatterjee, N. C.
	Dec.	"	Akbar Khan, Sir M.

## 1921.

	Jan.	5.	Ray, J. N.
	Feb.	2.	Jain, Chhote Lal
100	"	2.	Mukerjee, R. P.
	"	"	Mookerjee, S. C.
	Mar.	2.	Agharkar, S. P.

June 1. Muzamilullah Khan,  
Sir Mohammad

Sept.	7.	Ray, H. C.	
Nov.	2.	Hora, S. L.	105

## 1922.

Feb.	1.	Bhattacharya, V. S.	
"	"	Chopra, R. N.	
April	5.	Abdul Ali, A. F. M.	
Sept.	6.	Das-Gupta, S. N.	
Nov.	1.	Strickland-Anderson, Mrs.	110

## 1923.

Mar.	7.	Labey, G. T.	
"	"	Stamp, L. D.	
May	2.	Shebbeare, E. O.	
June	6.	Howard, Sir A.	
"	"	Hutton, J. H.	115
Aug.	1.	Biswas, K. P.	
Dec.	5.	Chopra, B. N.	
"	"	Barwell, N. F.	
"	"	Sen, H. H. Lakshman	
"	"	Pande, S. B.	120

## 1924.

Feb.	6.	Mahindra, K. C.	
Mar.	5.	Banerjee, P. N.	
"	"	Kanjilal M. N.	
"	"	Mitter, Sir B. L.	
"	"	Mitter, D. N.	125
"	"	McPherson, J.	
"	"	Sircar, Sir N. N.	
"	"	Sircar, Sir N. R.	
April	2.	Bahl, K. N.	
"	"	Ghose, K.	130
"	"	Richards, F. J.	
"	"	Haq, M. M.	
"	"	Mitra, J. C.	
May	7.	Bhattacharya, B.	
July	2.	Ray, A. C.	135
"	"	Mookerjee, S. P.	
Aug.	6.	Chatterji, S. K.	
"	"	Moloney, W. J.	
"	"	Roy-Chowdhury, B. K.	
"	"	Davies, L. M.	140
Nov.	5.	Chattopadhyay, K. P.	
"	"	Sahni, B.	
"	"	Mookerji, B. N.	
Dec.	3.	Das, S. N.	
"	"	Newman, Chas. F.	145
"	"	Pushong, E. S.	
"	"	Rogers, T. E.	
"	"	Basu, J. N.	
"	"	Ghose, S. C.	
"	"	Sarkar, C. K.	150
"	"	Roerich, G. N.	
"	"	Sen, H. K.	
"	"	Khan, R. R.	

## 1925.

	Feb.	4.	Guha, B. S.	
155	Mar.	4.	Benthall, Sir E. C.	
	"	"	Das, A. N.	
	April	1.	Perier, F.	
	"	"	Hobbs, H.	
	"	"	Sen, B. C.	
160	May	6.	Jatia, Sir O. M.	
	"	"	Khanna, V. L.	
	"	"	Koester, Hans	
	"	"	Staub, Max.	
	"	"	Wadia, D. N.	
165	June	3.	Datta, S. K.	
	July	6.	Bose, M. M.	
	Aug.	3.	Pruthi, H. S.	
	Nov.	2.	Acharya, P.	
	"	"	Chattopādhyāya, K. C.	
170	"	"	Crookshank, H.	
	"	"	Kimura, R.	
	"	"	Sharif, M.	

## 1926.

	Jan.	4.	Fleming, Andrew	
	"	"	Shortt, H. E.	
175	"	"	Sinton, J. A.	
	"	"	Stapleton, G. (Miss)	
	Feb.	1.	Rao, Y. R.	
	"	"	Ghuznavi, Sir A. K.	
	"	"	Hingston, H.	
180	"	"	Harris, H. G.	
	"	"	Ghuznavi, A. H.	
	Mar.	1.	McKay, J. W.	
	"	"	Datta, H. N.	
	"	"	Basu, N. K.	
185	"	"	Kramrisch, Stella	
	"	"	Bagnall, J. F.	
	April	5.	Senior-White, R.	
	"	"	Ghose, B. C.	
	"	"	Parker, R. H.	
190	"	"	Bhatia, M. L.	
	"	"	Mitter, K. N.	
	"	"	Jones, T.	
	June	7.	Lemmon, R. D.	
	July	5.	Mukhopadhyaya, P. K.	
195	"	"	Tyson, J. D.	
	"	"	Lyne, H. W.	
	Aug.	2.	Mukherjee, J. N.	
	"	"	Khettry, B.	
	Nov.	1.	Jameson, T. B.	
200	"	"	Modi, J. R. K.	
	"	"	Westcott, F.	
	"	"	Barhut, T. K.	
	"	"	Mills, J. P.	
	"	"	Galstaun, S.	
205	"	"	Chokhani, S.	
	"	"	Bagchi, P. C.	
	Dec.	6.	Aiyangar, S. K.	
	"	"	Guha, S. N.	
	"	"	Roy, A. K.	

## 1927.

	Jan.	3.	Chakravarty, N.	210
	"	"	Bivar, H. G. S.	
	Feb.	7.	Chatterjee, A.	
	"	"	Captain, D. M.	
	Mar.	7.	Hopkinson, A. J.	
	"	"	Urquhart, W. S.	215
	"	"	Bake, A. A.	
	"	"	Stagg, M.	
	"	"	Ghosh, P. N.	
	"	"	Abdul Kadir, A. F. M.	
	"	"	Fukushima, N.	220
	"	"	Wright, F. M.	
	May	2.	Watson, Sir A. H.	
	June	6.	Nandi, Maharaja S. C.	
	"	"	Jain, R.	
	"	"	Sinha, S. P.	225
	July	4.	Chatterjee, P. P.	
	"	"	Chakravarti, C.	
	"	"	Vance, R. L.	
	Nov.	7.	Tarkatirtha, B.	
	"	"	Mukherji, D.	230
	"	"	Brahmachary, S. C.	
	Dec.	5.	Namgyal, H.H. Sir Tashi	
	"	"	Dechhen, H.H. Kun-zang	
	"	"	Chowdhury, Sir C.	
	"	"	Mukerjee, S. K.	235

## 1928.

	Jan.	2.	Basu, N. M.	
	"	"	Mello, F. de	
	Feb.	6.	Sinha, S. C.	
	"	"	Ezra, Sir D.	
	"	"	Reneman, Nico	240
	"	"	Mukerji, Sir M. N.	
	"	"	Williams, T. T.	
	"	"	Shumsher, Sir Kaiser	
	Mar.	5.	Waight, H. G.	
	"	"	Gooptu, D. N.	245
	"	"	Neogi, P.	
	"	"	Biswas, C. C.	
	"	"	Eberl, Otto	
	April	2.	Mullick, K. C.	
	"	"	Bhattacharyya, N. C.	250
	"	"	Kumar, K. K.	
	"	"	Chowdhury, Rai J. N.	
	"	"	Harris, L. E.	
	May	7.	Chatterji, K. N.	
	"	"	Chatterjea, Sir N. R.	255
	"	"	Tucci, G.	
	"	"	Murray, E. F. O.	
	"	"	Gupta, J. N.	
	"	"	Ghosal, U. N.	
	"	"	Mallik, S. C.	260
	"	"	Lord Sinha of Raipur	
	"	"	Saha, M. N.	
	June	4.	Bhadra, S. N.	
	"	"	Hobart, R. C.	

265	June 4.	Bhattachali, N. K.	May 5.	Cooper, G. A. P.	
	July 2.	Roerich, N.	June 2.	Kenny, D. E. C.	
	Aug. 6.	Jaitly, P. L.	Nov. 3.	Austin, G. J.	
	" "	Urchs, O.	" "	Rahman, S. K.	
	" "	Ghuznavi, I. S. K.	" "	Newman, C. D.	325
270	" "	Heron, A. M.	Dec. 1.	Roy, K. K.	
	Nov. 5.	Olpadvala, E. S.			
	" "	Chopra, G.			
	" "	Statham, R. M.			
	" "	Reinhart, W.			
275	" "	Galstaun, J. C.			
<hr/>					
1929.	Jan. 7.	Basu, S. C.	1931.		
	" "	Ghose, M. C.	Jan. 5.	Shukla, J. P.	
	Feb. 4.	Narain, Hirde	" "	Chatterji, D.	
	" "	Jenkins, W. A.	" "	Evans, P.	
280	Mar. 4.	Travers, Sir W. L.	Feb. 2.	Wauchope, R. S.	330
	" "	Mitter, H. K.	" "	Douglas, G. W.	
	" "	De, J. C.	" "	Clough, J.	
	" "	Basu, B. K.	Mar. 2.	Bose, S. K.	
	" "	Mullick, P. N.	April 6.	Bhose, J. C.	
285	April 1.	Ghose, D. P.	" "	Prasad, S.	335
	" "	Rizvi, S. H. H.	May 4.	Bottomley, J. M.	
	" "	Sen-Gupta, N. C.	June 1.	Lort-Williams, J.	
	May 6.	Sharma, S. R.	Aug. 3.	Barua, K. L.	
	" "	Williams, H. F. F.			
290	" "	Pawsey, C. R.			
	July 1.	Dunn, J. A.			
	Aug. 5.	Sommerfeld, A.			
	Nov. 4.	Singh, J.			
	" "	Cotter, G. de P.			
295	" "	Campbell, G. R.			
	" "	Parry, N. E.			
	" "	Jarvis, R. Y.			
	" "	Edwards, L. B.			
	" "	Siddiqi, M. Z.			
300	" "	Mallya, B. G.			
	Dec. 2.	Khan, M. R.			
	" "	Fawcus, L. R.			
	" "	Thomas, H. W.			
<hr/>					
1930.			1932.		
305	Jan. 6.	Jain, N. K.	Feb. 1.	Holme, J. W.	
	" "	Haldar, S. K.	" "	Visser, Ph. C.	340
	" "	Basewitz, Count	Mar. 7.	Hughes, A.	
	" "	Hamilton, Sir D. M.	" "	Chakraborty, K. B.	
	" "	Martin, M. F. C.	" "	Darbari, M. D.	
	" "	Chakravarti, S. C.	May 2.	Thakur, A.	
310	Feb. 3.	Henderson, A. G.	" "	Muhammad, M.	345
	" "	Mahtab, U. C.	June 6.	Vere-Hodge, Mrs. E. H.	
	" "	Korni, M. A.	Nov. 7.	Suvarna Shumser	
	" "	Pettigrew, W.	" "	Driver, D. C.	
	" "	Chakravarti, M. N.	" "	Sitling, G. T.	
315	Mar. 3.	Mukharji, I. C.	Dec. 5.	Dutt, N.	350
	" "	Ashton, H. S.	" "	Boyle, C. A.	
	April 7.	Pesscin, J. F.	" "	Deb, S. K.	
	May 5.	Deo, Sir P. C. Bhanj			
	" "	Matthias, O. G.			
320	" "	Mallam, G. L.			
<hr/>					
			1933.		
			Jan. 2.	George, J.	
			" "	Dutch, R. A.	
			" "	Singh, R. P.	355
			Feb. 6.	Weilsted, T. A.	
			" "	Ghatak, J. C.	
			" "	West, W. D.	
			Mar. 6.	Seal, S. C.	
			June 5.	Morris, C. J.	360
			" "	Chakravarti, S. K.	
			" "	Rossetti, F. F. L.	
			July 3.	Dutt, G. S.	
			Aug. 7.	Sinh, Raghubir	
			" "	Vedantatirtha, V.	365
			Nov. 6.	Kavyatirtha, R. D.	
			" "	Krishnan, M. S.	
			" "	Coulson, A. L.	
<hr/>					
			1934.		
			Jan. 1.	Ahmad, M. J.	
			Feb. 5.	Bates, W. H.	370
			" "	Bhuyan, S. K.	

	Feb. 5.	Haldar, B. V.	Nov. 5.	Dey, M.	400
	" "	Kirby, W.	Dec. 3.	Burt, B. C.	
	" "	Law, B. C.	" "	Gladstone, J.	
375	" "	Nariman, R. K.	" "	Wilson, H. E. C.	
	" "	Pasricha, C. L.	" "	Brahmachari, P. N.	
	" "	Percival, F. G.	" "	Chatterjee, S. C.	405
	" "	Richter, H.	" "	Kapur, C. L.	
	" "	Sale, H. M.			
380	" "	Selzam, E. von			
	Mar. 5.	Craddock, Sir W. M.	1935.		
	" "	Modi, J. J. J.	Feb. 4.	Cookson, C. A.	
	" "	Singh, H. H. Sir K.	" "	Singh, S.	
	May 7.	Bent, W. A.	" "	Sayeeduddin, M.	
385	" "	Duncan, P. C.	" "	Sarkar, N. R.	410
	June 4.	Chatterji, B. R.	" "	Law, P. C.	
	" "	Daver, N. S.	" "	Lal, R. B.	
	Aug. 6.	Husain, S. A.	" "	Jaffar, S. M.	
	" "	Mullick, M. L.	Mar. 4.	Roy, S. Singh.	
390	" "	Rao, U. S.	" "	Jack, Hon. Justice	
	Sep. 3.	Auden, J. B.		R. E.	415
	" "	Krishnan, K. S.	" "	Groth, E. M.	
	" "	Ledrus, M.	June 3.	Singhanian, R. P.	
	" "	Ow-Wachendorf,	Aug. 5.	Shattock, J. S. H.	
		Baron W.	Sep. 30.	Dutt, M. N.	
395	" "	Sandhi, V. P.	" "	Basu, S. K.	420
	" "	Uiser, M. E. M. M.	" "	Mitter, S. K.	
	" "	Couchman, H. J.	" "	Howland, F.	
	Nov. 5.	Gee, E. R.	Nov. 4.	Bor, N. L.	
	" "	Hosain, Prince	" "	Anina Klebe.	
		A. M. M. M. A.	" "	Hirtzel, M. A. F.	425



# LIFE MEMBERS.

(Chronological.)

	5-11-84	C. S. Middlemiss (30 N.).		5- 7-11	R. B. S. Sewell (28 N.).	
	6- 6-88	A. P. Pennell (88 F.).		1-11-11	Kamaluddin Ahmad (24 N.).	
	6- 3-89	T. H. D. La Touche (10 N.).		5- 3-13	J. L. Simonsen 30 (19 N.).	
	11- 1-93	Sir Edward D. MacLagan (94 R.).		4- 3-14	J. Bacot (14 F.).	
5	1- 2-93	P. O. Bodding (14 N.).		5- 8-14	B. C. Law (33 R.).	
	31- 7-93	G. P. Tate (23 N.).		5- 7-16	G. Sircar (29 N.).	
	27- 9-94	W. Vost (94 F.).		6- 2-18	Johan van Manen (25 R.).	
	3- 7-95	Sir Nicholas D. Beatson-Bell (95 N.).		3- 4-18	B. Prashad (29 R.). 35	
	19- 9-95	K. C. De (26 R.).		2-11-21	S. L. Hora (30 N.).	
10	3- 5-98	Sir R. N. Mookerjee (29 R.).		6- 6-23	Sir A. Howard (30 N.).	
	5-12-00	J. W. A. Grieve (00 F.).		5-12-23	H.H. Lakshman Sen (24 N.).	
	6- 2-01	J. Ph. Vogel (25 F.).		7- 5-24	B. Bhattacharya (24 N.).	
	2- 7-02	F. Doxey (28 R.).		6- 8-24	L. M. Davies 40 (24 N.).	
	1- 6-04	G. H. Tipper (27 N.).		3-12-24	G. Roerich (28 F.).	
15	28- 9-04	H. E. Stapleton (26 R.).		6- 6-27	B. D. Jain (28 R.).	
	2- 8-05	D. McCay (29 F.).		5-12-27	Sir Chhajuram Chow- dhury (27 R.).	
	3- 1-06	J. A. Chapman (28 N.).		5-12-27	H.H. Sir Tashi Nam- gyal (27 N.).	
	7- 3-06	A. C. Woolner (28 N.).		5-12-27	H.H. Kunzang Dech- phen (27 N.). 45	
	19- 7-06	R. B. Whitehead (26 N.).		6- 2-28	Sir D. Ezra (28 R.).	
				6- 2-28	Sir Kaiser Shumsher Jung Bahadur Rana (28 N.).	
20	3- 7-07	J. Coggin Brown (28 N.).		2- 7-28	N. Roerich (28 F.).	
	3- 7-07	W. A. K. Christie (29 N.).		5-11-28	W. Reinhart (28 F.).	
	1- 1-08	Sir U. N. Brahma- chari (27 R.).		4-11-29	G. de P. Cotter (32 N.). 50	
	7- 4-09	C. A. Bentley (30 N.).		3- 3-30	H. S. Ashton (30 N.).	
	4- 5-10	S. B. Dhavle (10 N.).		5- 1-31	P. Evans (31 N.).	
25	4- 5-10	S. W. Kemp (29 F.).		7-11-32	Suvarna Shumser Jung Bahadur Rana (32 N.).	
	1- 2-11	James Inch (28 R.).		6- 2-33	J. C. Ghatak (33 R.).	
	7- 6-11	M. Hidayat Hosain (27 N.).		5- 2-34	H. M. Sale (34 N.). 55	
				5- 3-34	H.H. Sir K. Singh (34 N.).	

## SPECIAL ANNIVERSARY HONORARY MEMBERS.

Date of Election.	(Science.)
15-1-34	BARON ERNEST RUTHERFORD OF NELSON, O.M., President, Royal Society, London.
15-1-34	PROF. ALBERT EINSTEIN, c/o Princeton University, New Jersey, U.S.A.
15-1-34	M. A. LACROIX, Secrétaire Perpetuel, Académie des Sciences, Paris.
15-1-34	SIR SYDNEY BURRELL, K.C.S.I., F.R.S., Foxhill, Salisbury Road, Farnborough, Hants, England.
15-1-34	DR. SIR SVEN HEDIN, Stockholm, Sweden.

### (Letters.)

15-1-34	SIR JOHN MARSHALL, K.T., c/o Messrs. Grindlay & Co., Ltd., 54, Parliament Street, London.
15-1-34	DR. RABINDRA NATH TAGORE, Santiniketan, Bolpur, Birbhum.
15-1-34	PROF. TAHA HOSAIN, Cairo.
15-1-34	PROF. ARTHUR CHRISTENSEN, 62, Raadhusvej, Charlottenlund, Denmark.
15-1-34	DR. J. VAN KAN, President, Royal Society of Arts and Letters, Batavia, Java.
15-1-34	H.R.H. PRINCE DAMRONG RAJANUBHAB OF SIAM, Siam.

## ASSOCIATE MEMBERS.

Date of Election.	
1-2-22	*PIERRE JOHANNES, REV., S.J., B.LITT. (OXON.), <i>Professor of Philosophy</i> . St. Xavier's College, 30, Park Street, Calcutta.
1-2-22	*ANANTAKRISHNA SASTRI, MAHAMAHOPADHYAYA, VEDANTA-VISARADA, <i>Lecturer in Sanskrit</i> , Calcutta University. 32, College Square, Calcutta.
2-5-27	*N. N. VASU, RAI SAHIB. 20, Visvakosh Lane, Baghbazar, Calcutta.
2-12-29	†SARAT CHANDRA ROY, RAI BAHADUR, M.A., B.L., <i>Editor</i> , 'Man in India'. Church Road, Ranchi.
1-1-34	L. BOGDANOV. Flat 8-B, Solomon Mansions, 7, Royd Street, Calcutta.

\* Re-elected for a further period of five years on 7-3-1932 under Rule 2c.

† Re-elected for a further period of five years on 1-1-1934 under Rule 2c.

## INSTITUTIONAL MEMBERS

Date of Election.	
28-10-29	The Legatum Warnerianum (Oriental Department), University of Leyden, Leyden, Holland
2-12-29	The Adyar Library, Adyar, Madras
4-5-31	The Benares Hindu University Library, Benares.
1-6-31	The Ohitani University Library, Kyoto, Japan.
5 7-12-31	The Annamalai University Library, Annamalai-nagar, Chidambaram, S. India
30-10-33	The Allahabad University Library, Allahabad.
30-4-34	The Bombay University Library, Bombay.

## ORDINARY FELLOWS

Date of Election	
2-2-10	T. H. D. La Touche, B.A., F.G.S.
2-2-10	Sir Prafulla Chandra Ray, KT., C.I.E., M.A., D. SC.
2-2-10	Sir E. D. Ross, KT., C.I.E., PH.D.
7-2-12	Sir J. C. Bose, KT., C.S.I., C.I.E., M.A., D. SC., F.R.S.
5 7-2-12	Sir Samuel R. Christophers, KT., C.I.E., O.B.E., I.M.S., F.R.S.
7-2-12	C. S. Middlemiss, C.I.E., B.A., F.G.S., F.R.S.
5-2-13	J. Ph. Vogel, PH.D., LITT.D.
5-2-13	S. W. Kemp, B.A., D. SC., F.R.S.
3-2-15	G. H. Tipper, M.A., F.G.S., M.INST.M.M.
10 2-2-16	Sir Richard Burn, KT., C.S.I., I.C.S. ( <i>retd.</i> ).
2-2-16	Sir L. L. Fermor, KT., O.B.E., A.R.S.M., D. SC., F.G.S., M.INST.M.M. F.R.S.
7-2-17	F. H. Gravely, D. SC.
6-2-18	J. L. Simonsen, D. SC., F.I.C., F.R.S.
6-2-18	D. McCay, M.D., M.R.C.P., I.M.S.
15 5-2-19	J. Coggin Brown, O.B.E., M.I.M.E., F.G.S.
5-2-19	W. A. K. Christie, B. SC., PH.D., M.INST.M.M.
5-2-19	D. R. Bhandarkar, M.A., PH.D.
5-2-19	R. B. Seymour Sewell, C.I.E., M.A., SC.D., M.R.C.S., L.R.C.P. F.L.S., F.Z.S., F.R.S., I.M.S.
2-2-21	Sir U. N. Brahmachari, KT., M.A., PH.D., M.D., F.S.M.F.
10 1-2-22	Ramaprasad Chanda, B.A.
4-2-25	M. Hidayat Hosain, PH.D.
1-2-26	P. O. Bodding, M.A.
7-2-27	R. Knowles, C.I.E., B.A., M.R.C.S., L.R.C.P., I.M.S.
7-2-27	Johan van Manen, C.I.E.
25 7-2-27	B. Sahni, M.A., SC.D., D. SC., F.G.S.
7-2-27	A. C. Woolner, C.I.E., M.A., D. LITT.
6-2-28	H. E. Stapleton, M.A., B. SC., L.E.S. ( <i>retd.</i> ).
6-2-28	B. Prashad, D. SC., F.Z.S., F.R.S.E.
6-2-28	C. A. Bentley, C.I.E., M.B., D.P.H., D.T.M. & H.
4-2-29	Sir Albert Howard, KT., C.I.E., M.A.
30 4-2-29	J. H. Hutton, C.I.E., M.A., D. SC., I.C.S.
4-2-29	Sir Edward D. MacLagan, K.C.S.I., K.C.I.E.
3-2-30	G. de P. Cotter, B.A., SC.D., M.INST.M.M., F.G.S.
3-2-30	S. L. Hora, D. SC., F.Z.S., F.R.S.E.
35 3-2-30	J. P. Mills, I.C.S., M.A., J. P.

Date of  
Election

- 3-2-30 Meghnad Saha, D.SC., F.R.S.  
 2-2-31 S. Krishnaswami Aiyangar, M.A., PH.D., F.R.HIST.S.  
 2-2-31 R. N. Chopra, C.I.E., M.A., M.B., I.M.S.  
 2-2-31 R. B. Whitehead, I.C.S. (*retired*).  
 1-2-32 J. Bacot.  
 6-2-33 Percy Brown, A.R.C.A.  
 6-2-33 Ordhendra Coomar Gangoly, B.A.  
 6-2-33 Ghulam Yazdani, M.A.  
 5-2-34 D. N. Wadia, M.A., B.SC., F.R.G.S.

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## HONORARY FELLOWS

Date of  
Election

- 5-2-96 CHARLES ROCKWELL LANMAN. 9. Farrar Street. Cambridge, Massachusetts, U.S.A.  
 2-3-04 SIR GEORGE ABRAHAM GRIERSON. K.C.I.E., O.M., PH.D., D.LITT., LL.D., F.B.A., I.C.S. (*retired*). Rathfarnham, Camberley, Surrey, England.  
 6-9-11 KAMAKHYANATH TARKAVAGISA. MAHAMAHOPADHYAYA. 23/1B, Ganesh Mitter Lane, P.O. Shambazar, Calcutta.  
 5-8-15 SIR JOSEPH JOHN THOMSON, KT., O.M., M.A., SC.D., D.SC., LL.D., PH.D., F.R.S. Trinity College, Cambridge, England.  
 6-12-16 G. A. BOULENGER, F.R.S., LL.D. Jardin Botanique de L'Etat, Brussels. 5  
 4-2-20 SIR AUREL STEIN, K.C.I.E., PH.D., D.LITT., D.SC., D.O.L., F.B.A. c/o Indian Institute, Oxford, England.  
 4-2-20 A. FOUCHER, D.LITT. Boulevard Raspail 286, Paris, XVI.  
 4-2-20 SIR ARTHUR KEITH, M.D., F.R.C.S., LL.D., F.R.S. Royal College of Surgeons of England, Lincoln's Inn Fields, London, W.C. 2.  
 4-2-20 R. D. OLDHAM, F.R.S., F.G.S., F.R.G.S. 1. Broomfield Road, Kew, Surrey, England.  
 4-2-20 SIR DAVID PRAIN, KT., C.M.G., C.I.E., M.A., M.B., LL.D., F.R.S.E., F.L.S., F.R.S., F.Z.S., M.R.I.A. Royal Botanic Gardens, Kew, Surrey, England. 10  
 4-2-20 SIR JOSEPH LARMOR, KT., M.P., M.A., D.SC., LL.D., D.C.L., F.R.S., F.R.A.S. St. John's College, Cambridge, England.  
 4-2-20 SIR JAMES FRAZER, KT., D.C.L., LL.D., LITT.D. Trinity College, Cambridge.  
 4-2-20 J. TAKAKUSU. Imperial University of Tokyo, Tokyo, Japan.  
 2-3-21 F. W. THOMAS, C.I.E., M.A., PH.D., *Boden Professor of Sanskrit, University of Oxford*. 161, Woodstock Road, Oxford, England.  
 7-6-22 SIR THOMAS HOLLAND, K.C.S.I., K.C.I.E., D.SC., F.R.S. *Principal*, University of Edinburgh, Blackford Brae, Edinburgh. 15  
 7-6-22 SIR LEONARD ROGERS, KT., C.I.E., M.D., B.S., F.R.C.P., F.R.S., I.M.S. 24, Cavendish Square, London, 4.  
 7-1-25 STEN KONOW. Ethnographisk Museum, Oslo, Norway.  
 7-3-27 RT. HON'BLE THE EARL OF LYTON, P.C., G.C.S.I., G.C.I.E. Knebworth, Herts, England.  
 4-7-27 C. SNOUCK HUROGRONJE. Rapenburg 61, Leiden, Holland.  
 5-12-27 LT.-COL. SIR T. WOLSELEY HAIG, K.C.I.E., C.S.I., C.B.E., M.A., C.M.G. 34, Gledstanes Road, West Kensington, London, W. 14. 20

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Date of Election.	
2-12-29	SIR RAJENDRA NATH MOOKERJEE, K.C.I.E., K.C.V.O. 7, Harington Street, Calcutta.
2-12-29	DR. CHARLES J. H. NICOLLE, <i>Director</i> . Pasteur Institute, Tunis.
5-5-30	DR. R. ROBINSON, D.SC., F.R.S. The Dyson Perrins Laboratory, South Parks Road, Oxford, England.
5-5-30	DR. H. JACOBI, C.I.E. (HON.). 59, Niebuhrstrasse, Bonn, Germany.

## CHANGES IN MEMBERSHIP.

### LIST OF MEMBERS WHO HAVE BEEN ABSENT FROM INDIA THREE YEARS AND UPWARDS.\*

\* Rule 40.—After the lapse of three years from the date of a member leaving India, if no intimation of his wishes shall, in the interval, have been received by the Society, his name shall be removed from the List of Members.

The following members will be removed from the next Member List of the Society under the operation of the above rule:—

1. Count Bassewitz. (1930.)
2. Andrew Fleming. (1926.)
3. R. Friel. (1919.)
4. R. Y. Jarvis. (1929.)
5. Thornton Jones. (1928.)
6. Hans Koester. (1925.)
7. C. E. Lomax. (1911.)

### LOSS OF MEMBERS DURING 1935.

#### BY RETIREMENT.

##### *Ordinary Members.*

1. Syed Khalil Ahmad. (1930.)
2. Sivapada Bhattacharya. (1922.)
3. Nilmani Chakravarti. (1909.)
4. Sir J. C. Coyajee. (1925.)
5. Rev. E. C. Dewick. (1927.)
6. F. B. Fisher. (1929.)
7. H. A. Fooks. (1931.)
8. Miss Gerta Hertz. (1933.)
9. Otto Hubert. (1926.)
10. P. S. Jackson. (1923.)
11. R. B. Khambata. (1926.)
12. M. N. Mitra. (1929.)
13. Bhabadev Mukherjee. (1928.)
14. Aditya Nath Mukherjee. (1926.)
15. Saradindu Mukherjee. (1924.)
16. Karmajogin Ray. (1934.)
17. Sir C. V. Raman. (1922.)
18. Sir D. P. Sarbadhikari. (1909.)
19. A. T. Weston. (1934.)
20. B. C. Hobbs. (1935.)
21. G. F. Berthoud. (1929.)
22. J. F. Snaith. (1926.)
23. N. J. Judah. (1924.)

## BY DEATH.

*Ordinary Members.*

1. H. W. Acton. (1921.)
2. A. Ghaffar. (1926.)
3. A. G. Lunan. (1929.)
4. J. N. Maitra. (1918.)
5. L. N. Rai. (1928.)
6. V. N. Vasu. (1934.)
7. F. Williamson. (1934.)
8. Ganesh Prashad. (1935.)
9. P. J. Brühl. (1909.)
10. Narendranath Basu. (1928.)

*Special Anniversary Honorary Member.*

1. Henry Fairfield Osborn. (1934.)

*Honorary Fellows.*

1. H. A. Giles. (1917.)
2. Sylvain Levi. (1920.)

*Associate Member.*

1. H. Hosten, S.J. (1910.)

## UNDER RULE 38.

1. G. N. Bose Mullik. (1928.)
2. D. L. Clendenin. (1932.)
3. P. K. Das. (1928.)
4. Raja K. Deb. (1925.)
5. M. Eliade. (1931.)
6. G. S. Kewal. (1928.)
7. S. W. Laden La. (1925.)
8. J. J. Mahudavala. (1930.)
9. P. V. Ramanujaswami. (1926.)
10. Suhrid Kumar Roy. (1928.)

## MEDALLISTS.

### ELLIOTT GOLD MEDAL AND CASH.

#### RECIPIENTS.

- 1893 Chandra Kanta Basu.
- 1895 Yati Bhusana Bhaduri.
- 1896 Jnan Saran Chakravarti.
- 1897 Sarasi Lal Sarkar.
- 1901 Sarasi Lal Sarkar.
- 1904 { Sarasi Lal Sarkar.
- Surendra Nath Maitra.
- 1907 Akshoy Kumar Mazumdar.
- 1911 { Jitendra Nath Rakshit.
- Jatindra Mohan Datta.
- Rasik Lal Datta.
- 1913 { Saradakanta Ganguly.
- Nagendra Chandra Nag.
- Nilratan Dhar.
- 1918 Bibhutibhushan Datta.
- 1919 Jnanendra Chandra Ghosh.
- 1922 Abani Bhusan Datta.
- 1923 Bhailal M. Amin.
- 1926 Bidhu Bhusan Ray.
- 1927 Kalipada Biswas.
- 1931 T. C. N. Singh.
- 1932 P. N. Das-Gupta.
- 1933 Nirmal Kumar Sen.
- 1934 D. P. Roy Chowdhury.
- 1935 Kalipada Biswas.

### BARCLAY MEMORIAL MEDAL.

#### RECIPIENTS.

- 1901 E. Ernest Green.
- 1903 Sir Ronald Ross, KT., K.C.B., C.I.E., K.C.M.G., M.R.C.S.,  
F.R.C.S., D.P.H., LL.D., D.Sc., M.D., F.R.S.
- 1905 D. D. Cunningham, C.I.E., F.R.S.
- 1907 A. W. Alcock, C.I.E., M.B., LL.D., F.R.S.
- 1909 Sir David Prain, KT., C.I.E., C.M.G., M.A., M.B., LL.D., F.R.S.E.,  
F.L.S., F.Z.S., M.R.I.A., F.R.S.
- 1911 Carl Diener.
- 1913 William Glen Liston, C.I.E., M.D., D.P.H.
- 1915 J. S. Gamble, C.I.E., M.A., F.R.S.
- 1917 H. H. Godwin-Austen, F.R.S., F.Z.S., F.R.G.S.
- 1919 N. Annandale, C.I.E., D.Sc., C.M.Z.S., F.L.S., F.R.S., F.A.S.B.
- 1921 Sir Leonard Rogers, KT., C.I.E., M.D., B.S., F.R.C.P., F.R.C.S.,  
F.R.S.
- 1923 Sir Samuel Christophers, KT., C.I.E., O.B.E., F.R.S., F.A.S.B.,  
M.B., LT.-COL., I.M.S.
- 1925 J. Stephenson, C.I.E., B.Sc., M.B., CH.B., F.R.S., F.R.C.S.,  
F.R.S.E., LT.-COL., I.M.S.
- 1927 S. W. Kemp, B.A., D.Sc., F.R.S., F.A.S.B.
- 1929 Sir Albert Howard, KT., C.I.E., M.A., F.A.S.B.



- 1931 R. B. Seymour Sewell, C.I.E., M.A., SC.D. (CANTAB.),  
M.R.C.S., L.R.C.P., F.Z.S., F.L.S., F.A.S.B., F.R.S., LT.-COL.,  
I.M.S.  
1933 R. Row, O.B.E., D.SC.  
1935 B. Sahni, M.A., SC.D. (CANTAB.), D.SC., F.G.S., F.A.S.B.
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## SIR WILLIAM JONES MEMORIAL MEDAL.

### RECIPIENTS.

- 1927 Sir Malcolm Watson, KT., LL.D. (HON.), M.D., C.M., D.F.H.  
1928 Sir George A. Grierson, K.C.I.E., O.M., PH.D., D.LITT., LL.D.,  
F.B.A., HON. F.A.S.B., I.C.S. (*retired*).  
1930 Dr. Felix H. D'Herelle.  
1932 Dr. C. Snouck Hurgronje.  
1934 Rai Sir Upendra Nath Brahmachari, Bahadur, KT., M.A.,  
M.D., PH.D., F.S.M.F., F.A.S.B.
- 

## ANNANDALE MEMORIAL MEDAL.

### RECIPIENTS.

- 1927 Fritz Sarasin.  
1930 Dr. Charles Gabriel Seligman, M.D., F.R.C.P., F.R.S.  
1933 Dr. Eugène Dubois
- 

## JOY GOBIND LAW MEMORIAL MEDAL.

### RECIPIENTS.

- 1929 Max Weber.  
1932 Dr. Ernst J. O. Hartert, PH.D.  
1935 Prof. Leo Semenowitch Berg.
- 

## PAUL JOHANNES BRÜHL MEMORIAL MEDAL.

### RECIPIENTS.

- 1931 Rev. Ethelbert Blatter, S.J.  
1934 Isaac Henry Burkill, M.A.
- 

## INDIAN SCIENCE CONGRESS MEDAL, CALCUTTA.

### RECIPIENT.

- 1935 Meghnad Saha, D.SC., F.R.S., F.A.S.B.
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## PROCEEDINGS OF THE ORDINARY MONTHLY MEETINGS, 1935.

JANUARY, 1935.

*No Meeting.*

FEBRUARY, 1935.

An Ordinary Monthly Meeting of the Asiatic Society of Bengal was held on Monday, the 4th, immediately after the termination of the Annual Meeting.

PRESENT.

L. L. FERMOR, ESQ., O.B.E., A.R.S.M., D.Sc., F.G.S., M.INST.M.M., F.R.S., F.A.S.B., President, in the Chair.

*Members :*

Brahmachari, Sir U. N.  
Brown, Mr. Percy  
Calder, Mr. C. C.  
Chakravarti, Mr. C.  
Chatterjee, Mr. P. P.  
Chatterjee, Dr. S. K.  
Dikahit, Mr. K. N.

Hobbs, Mr. H.  
Holme, Mr. J. W.  
Hora, Dr. S. L.  
Hosain, Dr. M. Hidayat  
Jenkins, Dr. W. A.  
Manen, Mr. Johan van  
Mitter, Sir B. L.

Mukherjee, Dr. J. N.

The minutes of the last meeting were read and confirmed.

The General Secretary announced that the presentations of books, etc., received during the last month, would be exhibited in the next Monthly Meeting.

The following candidates were balloted for for election as Ordinary Members :—

(1) *Lal, Ram Bihari*, M.B., B.S., D.P.H., D.T.M. & H., D.B., Professor of Vital Statistics and Epidemiology, All-India Institute of Hygiene and Public Health, 21, Chittaranjan Avenue, Calcutta.

Proposer : R. N. Chopra.

Seconder : S. L. Hora.

(2) *Hobbs, Bertram Carmichael*, Solicitor, c/o. Sanderson and Morgans, 26, Dalhousie Square, Calcutta.

Proposer : Johan van Manen.

Seconder : Ramaprasad Chanda.

(3) *Law, Parbatty Churn*, 223, Cornwallis Street, Calcutta.

Proposer : Bhabani Churn Law.

Seconder : Johan van Manen.

(4) *Sayeeduddin, Mohammed*, B.Sc., M.A. (Edin.), F.R.M.S., F.F.Sc., Professor of Botany, Osmania University, Hyderabad, Deccan.

Proposer : S. L. Hora.

Seconder : H. S. Pruthi.

(5) *Vijayaraghavacharya, Sir T.*, Diwan Bahadur, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, Secretariat, New Delhi.

Proposer : S. L. Hora.

Seconder : Johan van Manen.

(6) *Prasad, Ganesh*, M.A., D.Sc., Hardinge Professor of Higher Mathematics, Calcutta University, 2, Samavaya Mansions, Corporation Street, Calcutta.

Proposer : J. N. Mukherjee.

Seconder : L. L. Fermor.

(7) *Jaffar, S. M.*, B.A., Author, Translator to the Judicial Commissioner, North-West Frontier Province, 1508, Khudadad Street, Peshawar City, N.W.-F.P.

Proposer : M. Hidayat Hosain.

Seconder : K. N. Dikshit.

(8) *Cookson, Christopher Arthur*, Assistant, Bombay Co., Ltd., 19, British Indian Street, Calcutta.

Proposer : Johan van Manen.

Seconder : Percy Brown.

(9) *Singh, Jagatjit*, His Highness Maharaja Bahadur, G.C.S.I., G.C.I.E., G.B.E., Colonel Farzand-i-Dilband Rasikhul-i-Itikad, Daulat-i-Inglishta Raja-i-Rajgan, Maharaja of Kapurthala, Kapurthala State, Punjab.

Proposer : Johan van Manen.

Seconder : Sir U. N. Brahmachari.

(10) *Sarkar, Nalini Ranjan*, Mayor of Calcutta, Hindusthan Buildings, Corporation Street, Calcutta.

Proposer : Johan van Manen.

Seconder : Sir U. N. Brahmachari.

(11) *Singh, Sarabjit*, M.A., B.L., P.O. Imphal, Manipur State.

Proposer : S. L. Hora.

Seconder : R. N. Chopra.

The General Secretary reported the following loss of membership, since the previous meeting, by death :—

(7) Rai Bahadur Shiv Ram Kashyap (An Ordinary Fellow, 1933).

The General Secretary reported the following loss of membership, since the previous meeting, by resignation :—

(10) I. M. Puri (An Ordinary Member, 1928).

(11) H. M. Bose (An Ordinary Member, 1925).

(1) Sir D. P. Sarvadhikary (An Ordinary Member, 1909).

(2) P. S. Jackson (An Ordinary Member, 1923).

(3) H. A. Fooks (An Ordinary Member, 1931).

The General Secretary reported that the election of—

(2) B. M. Vyas (Elected on 3-9-34),

has become null and void, under Rule 9.

The General Secretary reported that the following has withdrawn his application for membership, since the previous meeting :—

(1) S. A. Ashgar (Elected on 3-9-34).

The President announced the result of the ballot for the election of Ordinary Members and declared that all candidates had been duly elected.

The President announced that no meeting of the Medical Section had yet been arranged to be held during the current month.

### MARCH, 1935.

An Ordinary Monthly Meeting of the Asiatic Society of Bengal was held on Monday, the 4th, at 5-30 p.m.

### PRESENT.

SIR DAVID EZRA, KT., F.Z.S., M.B.O.U., Vice-President, in the Chair.

#### Members :

Bose, Mr. M. M.  
Calder, Mr. C. C.  
Chakravarti, Mr. C.  
Chanda, R. B. R.  
Chatterjee, Mr. P. P.  
Dey, Mr. Mukul  
Driver, Mr. D. C.  
Ghose, Mr. T. P.  
Ghuznavi, Mr. I. S. K.

Hobbs, Mr. Harry  
Hora, Dr. S. L.  
Jain, Mr. C. L.  
Ledrus, Rev. M., S.J.  
Manen, Mr. Johan van  
Prasad, Mr. Sharda  
Rahman, Mr. S. K.  
Rao, Mr. U. S.  
Ray, Dr. H. C.

#### Visitors :

Husain, Mr. S. Wajahat

Sen, Mr. A. B.

The minutes of the last meeting were read and confirmed.

The General Secretary reported receipt of nine presentations of books, etc., which had been placed on the table for inspection.

The following candidates were balloted for for election as Ordinary Members :—

(12) *Jack, The Hon'ble Mr. Justice Robert Ernest*, I.C.S., United Service Club, Calcutta.

Proposer : L. L. Fermor.

Seconder : J. Lort-Williams.

(13) *Groth, Edward M.*, American Consul, American Consulate General, 9, Esplanade Mansions, Esplanade, Calcutta.

Proposer : Johan van Manen.

Seconder : L. L. Fermor.

(14) *Roy, Saileswar Singh*, Landholder, 15, Lansdowne Road, Calcutta.

Proposer : Johan van Manen.

Secunder : Sir U. N. Brahmachari.

The General Secretary reported that there had been no loss of membership since the previous meeting, by death.

The General Secretary reported the following loss of membership, since the previous meeting, by resignation :—

(4) E. C. Dewick (An Ordinary Member. 1927).

The General Secretary reported that the election of—

(1) A. K. Chanda (Elected on 5-11-34),  
has become null and void, under Rule 9.

The General Secretary reported that there had been no withdrawals of application, since the previous meeting.

The General Secretary reported the constitution of the various Standing Committees of the Society for the year 1935-36 to be as follows :—

*Finance Committee :—*

President	} <i>Ex-officio.</i>
Treasurer	
General Secretary	
Dr. J. N. Mukherjee.	
Dr. A. M. Heron.	

*Library Committee :—*

President.	} <i>Ex-officio.</i>
Treasurer.	
General Secretary.	
Philological Secretary	
Jt. Philological Secretary	
Physical Science Secretary	
Biological Science Secretary	
Medical Secretary	
Anthropological Secretary	}
Library Secretary	

*Publication Committee :—*

President.	} <i>Ex-officio.</i>
Treasurer.	
General Secretary.	
Philological Secretary	
Jt. Philological Secretary	
Physical Science Secretary	
Biological Science Secretary	
Medical Secretary	
Anthropological Secretary	}
Library Secretary	

The Chairman announced the result of the ballot for the election of Ordinary Members and declared all candidates duly elected.

The Chairman announced that no meeting of the Medical Section had been arranged to be held during the current month.

The following communication was made and commented upon :—

1. JOHAN VAN MANEN.—*Recent Advances in the study of Chinese Philosophy.*

The recent issue of the second volume of Forke's elaborate history of Chinese Philosophy makes it opportune to consider the present position of the study of Chinese Philosophy in relation to a comprehensive historical study of the philosophy of all mankind.

An attempt is made to review and assess the available material.

Mr. Van Manen said that history might be compared to map making. The progressive description of historical knowledge was like filling in blank spaces on the map with details of greater and greater precision and growing minuteness. Considered from the point of view of function one might think of the growth of knowledge as akin to the development of communications in a country, or to growing internal specialization and development of nerve centres in the human brain. So modern a book of reference as the latest edition of the Encyclopædia Britannica dealt in its article on the history of philosophy only under the headings of Greek Philosophy, Patristic Philosophy, Arabic and Jewish Philosophy and Modern Philosophy. In a brief introductory paragraph to the elaborate article one would find the following sentences :—'To all intents and purposes ancient philosophy is essentially Greek Philosophy. This is not to deny the reality and value of Eastern Philosophy, but it remains true that Western Philosophy from Thales onwards is sufficiently self-contained to warrant separate treatment. There are separate articles dealing with Brahmanism, Buddhism, Indian Philosophy, Arabian Philosophy, Jewish Philosophy, etc.' Baldwin's Dictionary of Philosophy and Psychology, which represents a standpoint of about a quarter of a century ago, says under the heading 'History of Philosophy' that the subject 'may, as a whole, be divided into two great portions, that which treats of Oriental Philosophy and that which deals with Occidental or European and American Philosophy'. The article on Oriental Philosophy deals with Egypt, Babylonia-Assyria, Persia, India and China. Up to recently general books on the history of Philosophy dealt with non-European Philosophy as a rule as a negligible quantity. Speaking in very broad generalizations it is only with the publication of Deussen's History of Philosophy that Indian Philosophy was incorporated on an equal footing, and acquired in the West citizen rights in the republic of human thought. A. Forke has felt the ambition of achieving for Chinese Philosophy what Deussen had done a few decades ago for Indian Philosophy. In 1927, he published his history of ancient Chinese Philosophy, followed in 1934 by his history of mediæval Chinese Philosophy. A third volume is to complete the work, continuing the history to modern times. The two published volumes cover about a thousand quarto pages. The material contained in them is not chiefly based, as in most of this kind of works hitherto published, on the chance material to be found dealt with in isolated monographs or translations, but goes beyond second-hand sources, dealing systematically with the single subjects on the basis of the original texts. It passes in review in a methodical manner the entire material available in China. Passages quoted in translation in the course of the work are everywhere given in the original in foot-notes.

The speaker then gave a brief sketch of the study of Chinese Philosophy in the West before Forke.

In the *Mélanges posthumes* of Abel Rémusat (Paris, 1843) there is a brief essay of 45 pages on Chinese Philosophy. It opens with a list of names of Western scholars who had studied the subject before, and it enumerates Herdtrich, Carpzov, Bayer, Noël, Leibnitz, Bülfinger, and 'many others'.

He exhibited some older publications, such as Intorcetta's *Confucius, Sinarum Philosophus, sive Scientia Sinensis* (Paris, 1687) and also Marshman's *Works of Confucius containing the original text with translation* (Serampore, 1809), the latter a work of special interest for inhabitants of Calcutta.

He then referred to the more recent works of Von Brandt, de Harlez, Faber, Grube, Wieger, Suzuki, Wilhelm, Tucci, Zenker, and Hackmann, as well as to some recent Chinese and Japanese Historians of Chinese Philosophy. He showed how in the last 50 years a great mass of material had been published on Chinese religion in which the religious and philosophical aspects had not yet been clearly differentiated.

A great drawback was that the available literature on Chinese philosophy and religion is so extensive and so difficult of access that few scholars can utilize all that has already been published in learned and general periodicals, in the form of academical dissertations, of pamphlets, and of separate chapters in general works.

The first compendious treatment of Chinese Philosophy in the West was perhaps the Chinese part of *Die Philosophie im Fortgange der Weltgeschichte* by Windischmann of which the first of the four volumes (1827) is devoted to China. The work is based on the scanty material available at the time, and is rather wide than deep.

Another interesting treatise is the first part of an *Einleitung in das Verständniss der Weltgeschichte* by Aug. Gladisch, who drew a parallel between Chinese and Pythagorean thought, Posen, 1845.

Zenker's *Geschichte der Chinesischen Philosophie* was published in two volumes in 1926 and 1927. It is written with enthusiasm and more primarily in the interest of philosophical than philological study. Hackmann's *Chinesische Philosophie* was published in 1927 in one volume. The author is a sinologist by profession and his work is an excellent and well-balanced production though briefer than Forke's compendium and without Chinese quotations.

In English Suzuki's *Brief History of Early Chinese Philosophy*, London, 1914, is a readable, but as the title indicates, a briefer and more fragmentary work.

! A similar work in Italian is Tucci's *Storia della Filosofia Cinese Antica*, Bologna, 1922.

The speaker then rapidly sketched the discovery of Taoism and the spread of the Tao Te King in Europe, of which at present some fifty European translations exist, followed by the study of other masters of the Taoistic school, such as Lie Tszé and Chuang Tszé.

It had to be noted that notwithstanding the many translations and the fact that the Chinese text of the Tao Te King had been printed by five different European scholars since 1842, Western scholarship had not yet produced an adequate critical *variorum* edition of the important work. He also referred to the study of the enigmatic old divination book, the Yi King, of which at present some seven European translations exist.

He concluded with the expression of his opinion that thanks to Forke's great work, Chinese thought had now acquired a lasting place in all future history of the thought of mankind and that the big blank hitherto occurring in the philosophical map of the world with regard to China could never be left empty again.

Mr. H. Hobbs asked for a definition of the word philosophy.

Mr. Van Munen replied that there were almost as many definitions as philosophers. The richer the contents of a concept, the more difficult

to enclose them fully or adequately in words. A Chinese philosopher had said, *our truth is not the truth*. A definition in a well-known dictionary was 'the science of science', also expanded to 'the science of the foundations of knowledge'. James prefers a more human and less scholastic definition and says that philosophy is simply 'man thinking'. The *Encyclopædia of Religion and Ethics* agrees with this view in using the neat phrase 'rational reflexion upon experience'. If he recollected well, a definition given by Cardinal Mercier was that philosophy is the search of the deepest causes of the most general principles. From other points of view it may be said that philosophy is the study of the connection of existence in all its forms, or the study of principles, generalities, as against facts and particulars, which might be called science. Again, it might be held that philosophy seeks meaning, value, interpretation. Other simple definitions are to call philosophy classification, not only in a superficial but in progressively deeper ways, or mental research of unity or again differently, to call it the art of synthesis or co-ordination.

Mr. *Hobbs* suggested that philosophy aims at finding the exact truth which, seeing that man is necessarily biased, must be a hopeless ideal. However, the less bias, the nearer the truth.

The following paper was read :—

1. S. WAJAHAT HUSAIN.—*Mahmūd Gāwān*.

Mahmūd Gāwān was one of the most remarkable characters in mediæval-Indian History and a scholarly life of him, based on original research, has not been published. The present paper supplies that want. All the sources, except those in the Portuguese language, have been used by the author in this compilation.

The life-history of Mahmūd Gāwān is treated under the following heads in this paper :—

Early life and education. Travels and trading. Arrival in India and rise to the position of Prime Minister in the Deccan. Administrative skill. Military skill. Educational activities. Activities as author and poet. Domestic life. The end.

Dr. H. C. Ray enquired for details concerning the sources utilized by the author. Had any local chronicles been discovered dealing specifically with Gāwān or the dynasty he served and belonging to a contemporary period? He warned against depending too much on Firishta whom he has been found sometimes rather unreliable, as he had shown in his *Dynastic History of Northern India*. He requested the author not only to quote his sources in detail but to appraise their value. He further wished for a statement from the author as to how far his paper had added to our previous knowledge of Gāwān.

Mr. R. Chanda suggested that the usefulness of the paper might be enhanced by the addition of an appendix giving a literal and critical translation of Firishta's text.

Mr. *Hobbs* remarked that the life-story revealed by the author clearly indicated the outstanding character of Gāwān. A man rising to the position to which Gāwān rose under a potentate of a character as that of his master and in the circumstances of his times must needs be of great human interest.

In reply Mr. *Wajahat Husain* said that Mullā 'Abdul Karim Hamadānī, a contemporary and friend of Mahmūd Gāwān, has written a work on the life of Gāwān from his birth till his last days. Firishta states that he has based his biography of Gāwān chiefly on this contemporary writer, but this source has apparently not survived and no copy of the work can be traced. No other independent contemporary sources are known.



In his paper the speaker had quoted in detail all sources utilized by him, which are practically all 'secondary' ones.

As to a translation of Firishṭa's data, there would be a difficulty. There is no completely consolidated section concerning Gāwān in Firishṭa. References to him are scattered throughout his work and might be all sought out and brought together, but this was not exactly the aim of the present paper which attempted a connected narrative embodying the dispersed data with any comments that modern scholarship had produced with regard to them. In a way it was true that his paper did not give much that was entirely new but he claimed that it was more detailed and complete than the previous notices of Gāwān hitherto published.

The following exhibits were shown and commented upon :—

1. S. L. HORA.—*An interesting Implement for Mud-fishing from Uttarbhag, Lower Bengal.*

Recently, an article on 'Mud-fishing in Lower Bengal' was published in the *Journal* of the Society. It may be recalled that in the various devices described therein fishes were collected by hand from semi-liquid mud. This method may be practicable in small fisheries, but when bigger areas are drained off for fishing purposes, a circular basket of the usual material and make, about 9½ inches in diameter and 23 inches in total length, is used. One end of the basket is open and the mouth is strengthened by a circular band of broad bamboo-strips. At a distance of about 16 inches from the mouth, there is another band of bamboo-strips, after which the split-bamboo sticks are pulled together and secured by a loop of string. The loop is fastened to the nearest band. In this way, the other end of the basket is closed and made to serve as a handle for manipulating the basket.

The split-bamboo sticks, which run lengthwise, are about half an inch apart so that when the open end is dragged through mud, it passes out through the wide spaces and only the fish are trapped inside the basket. The author is given to understand that it is a very effective implement for mud-fishing and that with its help large quantities of *Jiol Machh* (Live Fish) are captured from marshy areas in Lower Bengal.

Mr. Van Manen enquired whether the size of the mazes of the basket was so calculated that small fish of no economic importance should escape, and what was the average size of the fish caught.

In reply to Mr. Van Manen's enquiry Dr. Hora stated that the implement was not meant for catching small fish, such as *Putiya* (*Barilius* spp.), but for specimens of about 4 inches to 1 foot in length. The interspaces between the split-bamboo sticks are sufficiently wide to allow small fish to pass out along with mud. *Koi machh* of about 6 inches in length were plentiful at Uttarbhag and these had presumably been collected by an implement of this type.

Mr. I. S. K. Ghuznavi remarked that the use of the appliance was principally to avoid stings of *Jiol Singi māchh* and *Māgur*, etc., when seeking for them in semi-fluid mud where they cannot be caught with a net.

2. SHARADA PRASAD.—*Two Sculptural Fragments from Central India.*

(1) Head of a deity, perhaps Viṣṇu. Probable find-place Sohagpur, site of ruined Chedi temples, South Rewa Baghelkhand. Possibly of the late mediæval period. The elaborate *Kirita* 'crown', the heavy pendant in the elongated ear (the other ear is missing), and the thick lower lip are among the remarkable features conforming to the Gupta style. The half-closed eyes suggest the meditative mood. The tranquil expression of the face is highly impressive.

(2) Head of an equestrian statue. Discovered in a forest 30 miles south-west of Satna. Date c. A.D. 1700. The grotesque but vigorous face presumably represents a Gond Chief. Similar images are known to be worshipped among the Gonds under the name of Bara Deva. An entire specimen is found in the Lal Bihari Memorial Collection, where the Chief rides a horse.

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APRIL, 1935.

An Ordinary Monthly Meeting of the Asiatic Society of Bengal was held on Monday, the 1st, at 5-30 P.M.

PRESENT.

L. L. FERMOR, Esq., O.B.E., A.R.S.M., D.Sc., F.G.S., M.INST.M.M., F.R.S., F.A.S.B., President, in the Chair.

*Members :*

Agharkar, Dr. S. P.	Ghose, Mr. T. P.
Brahmachari, Sir U. N.	Hobbs, Mr. H.
Calder, Mr. C. C.	Hora, Dr. S. L.
Chanda, R. B. R.	Hosain, Dr. M. Hidayat
Chatterjee, Mr. P. P.	Jack, The Hon'ble Mr. Justice R. E.
Dey, Mr. Mukul	Manen, Mr. Johan van
Ezra, Sir David	Prashad, Dr. Baini
Gee, Mr. E. R.	Rahman, Mr. S. K.
Ghose, The Hon'ble Mr. Justice M. C.	Roy, Mr. Singh

*Visitors :*

Bose, Mr. H. K.	Chhabra, Dr. B. Ch.
	Fermor, Mrs.

The minutes of the last meeting were read and confirmed.

The General Secretary reported receipt of five presentations of books, etc., which had been placed on the table for inspection.

The General Secretary announced that there had been no applications for membership, since the previous meeting.

The General Secretary reported the following loss of membership since the previous meeting, by death :—

(1) Dr. Ganesh Prasad (An Ordinary Member, 1935).

The General Secretary reported the following loss of membership, since the previous meeting, by resignation :—

(5) Sivapada Bhattacharyya (An Ordinary Member, 1922).

The General Secretary reported that there had been no lapses of election, since the previous meeting, under Rule 9.

The General Secretary reported that :

(1) Mr. Justice C. O. Remfry (Elected on 3-12-34),

had withdrawn his application, since the previous meeting.

The Chairman announced that no meeting of the Medical Section had been arranged to be held during the current month.

The following exhibit was shown and commented upon :—

1. BAINI PRASHAD.—*Ethnological Specimens from the Naga Hills, Assam.*

During the course of a zoological tour about the end of February of this year in the Naga Hills, Assam, the opportunity was taken to collect a few ethnological specimens of this interesting group of tribes.

There is a strip of irregular hills running down from the Himalayas separating Assam and Bengal from Burma. The River Brahmaputra at the northern end of these broken ranges of hills makes a deep inroad into the hills, and it is in the hills generally known as the Naga Hills and which are situated immediately to the south of the encroaching valley referred to above that the Naga tribes have their present home. Starting from Kohima, the headquarters of the Naga Hills and of the Angami tribe, the tour extended through the Sema area to Mokokchung which may roughly be taken as the junction of the Sema and the Ao tribal areas. *En passant* it may be mentioned that Mokokchung is the Sub-Divisional headquarters and second administrative town of the whole area. From Mokokchung the party travelled through the Ao country to Nakachari railway station in the Sibsagar District and it was during this tour that the collection referred to above was made.

The exhibits consist of samples of dress of both men and women of the three tribes, samples of their *daos* and spears, a few specimens of *dao*-holders and three interesting types of beer-drinking mugs. In addition effigies of human and *mithan* heads collected in the area are also exhibited.

Dr. Prashad said :—

Opportunity was taken by me and my colleague, Dr. B. N. Chopra during the course of a zoological tour in the Naga Hills last February to collect a few ethnological specimens, which appeared to have some interest for us amateurs, from the three tribes of Nagas through whose territory we travelled.

Before explaining the exhibits it would be useful to give a short account of the country and the people visited by us. Running down from the Himalayas and separating Assam and Bengal from Burma is a fairly broad strip of irregular hills. The River Brahmaputra at the northern end of these broken ranges of hills makes a deep inroad into the hills resulting in a valley, and it is in the hills situated immediately to the south of this encroaching valley and generally known as the Naga Hills that the Naga tribes have their present home. The Naga Hills are directly under the administration of the Government of Assam and are administered as a separate district under a Deputy Commissioner. The administration of this area is unique, in that there is no police, no pleaders or the extra-heavy machinery of administration. The Deputy Commissioner and the Sub-Divisional Officer with the help of a number of *Dobhasis* or interpreters successfully carry on the entire administration of the area.

Starting from Kohima, which is the headquarters of the Naga Hills district and which small town lies between the Manipur railway station on the Assam-Bengal Railways and Manipur town, we travelled through the hills inhabited by the Angami and the Sema Nagas, to Mokokchung which is the second administrative town of the district; Mokokchung also marks the junction of the Sema and the Ao tribal areas. From Mokokchung we travelled through the Ao country to Nakachari railway station in the Sibsagar District, and then entrained back for Calcutta.

It would be presumptuous on my part to claim anything but an amateur's knowledge gained firsthand during this short tour of this interesting group of tribes, the Angami, the Sema and the Ao Nagas, during the three weeks or so which we spent in this part of the country. Detailed accounts of the first two tribes, the Angami and the Sema, have been published by Dr. J. H. Hutton, at present Deputy Commissioner of the Naga Hills and a world-renowned authority on the Nagas, in the series of monographs on the primitive tribes of Assam, while two monographs on the Ao Nagas have been published by Dr. W. C. Smith and Mr. J. P. Mills. These four volumes have been of very great help to me in understanding the social life and customs of the three tribes.

Dr. Hutton originally derived the word 'Naga' from the Sanskrit 'Nag', but later in view of the fact that Ptolmey in the 3rd or 4th Century A.D. and Shiahuddin Talish in the 16th Century both speak of Nagas as 'Nanga' or naked, he adopted the Sanskrit word 'Nagna' as the derivative of Naga. He, however, added that as the Assamese call them Naga, he is doubtful if this origin is correct, as he believes that both Ptolmey and Shiahuddin's derivation of Naga from Nanga may be due to their informers knowing Urdu only, thus leading these two authors to jump to the conclusion that 'Naga' is derived from 'Nanga'.

I do not propose to give you any detailed account of the three tribes, but a reference may be made to the fact that in the earlier days before the area came under British administration the Nagas were great head-hunters and relics of this custom are today to be found in the fact that they hang outside their houses heads of any animals which they may have killed in hunting or in chase. As human heads are impossible to obtain these days, these interesting people have taken to making effigies in clay of human heads, one of which is being exhibited today. The poorer folks who are even unable to obtain the heads of *mithans*, make them out of the sternal bones of fowls in which the horns are made of pieces of wood stuck through the sternum.

The dress of these people is very simple and both for males and females consists of a loin cloth which is either worn in the form of a kilt as in the case of the Angamis and women of all the three tribes, or as a flap known as the 'langta' as worn by the males of the Sema and the Ao tribes. There is in addition a larger piece of cloth worn in the form of a 'chaddur' over the shoulders. Samples of these cloths of different types are exhibited. The interesting point about the cloths of different types is the variety

and richness of colour, but unfortunately in the areas under the influence of the Christian missions these richly coloured cloths are being replaced by drab, dark white or khaki.

The Nagas are great beer-drinkers, except in the areas under the influence of Christian missions and have both simple and elaborately worked beer-drinking mugs. *En passant* it may be mentioned that beer is a light, fermented liquid made by the Nagas themselves from rice. Their mugs are usually made out of a thick species of bamboo, which is locally quite plentiful. These vary from a very simple type made only of a peeled internode of bamboo to a highly polished and worked elongated type as made by the Chung tribe. Another interesting type of mug which was obtained at Chonglymsen and which is made of clay in the form of a highly elaborate jar with a perforated top. In addition some of the Nagas use the horn cores of *mithans* as their beer mugs. Almost all of them use thin hollow bamboo sticks for sucking the beer in the same way as the more civilized nations use straws nowadays. Some spears and *Daos* of the Nagas collected in the area are also exhibited.

In conclusion I have to express my very great indebtedness to Dr. J. H. Hutton, Mr. T. C. D. Lambert and their Staff for making all arrangements for my tour. My thanks are also due to my colleague Dr. B. N. Chopra for help in collecting the material exhibited.

Dr. Hora agreed that the Naga Hills constitute a wonderful place for ethnologists. He recalled his visit to the Naga Hills and the Manipur valley in 1920 with the late Dr. N. Annandale. His own experience corroborated the remarks made by Dr. Prashad about the distinctive dress and implements of warfare used by the various Naga tribes. He noticed, however, that the colour patterns and designs on the cloths had changed somewhat during the last 15 years. He praised the chastity of the Naga women and the good quality of the Naga beer.

Mr. Hobbs said :—

The Nagas much resemble the Scots.

Their spear shafts are decorated with human hair or fine cane, woven in different colours and designs. They wear a kilt, and play the pipes.

Forty odd years ago I was shooting in the vicinity of the Naga country. One of the men collapsed. The planter in charge of the party sent for assistance to a Naga village. The chief sent a woman who, after the man had been placed in a basket, carried him up the hill as though he was an infant.

The Nagas are regardful of the morality of their women, and no wise man would interfere with them. A planter friend of mine had an assistant, a splendid physical specimen, tall, blonde and brawny. One evening a party of Nagas was walking in file past this young fellow's bungalow. The women as usual bringing up the rear. One of the girls took him in at a glance. That night she came from her village, ten miles away, to the young man's bungalow. Very wisely he took her to the manager's wife who took care of her. About noon the next day the Nagas took her away. She came the next night and the same thing happened. The third time she did this the Nagas gave her a tremendous thrashing, which brought the Naga love story to an end.

A reference by Dr. Hora to motor cars caused me to recall a story told by Mr. Little, Chief Engineer, P.W.D., Assam. He took the first motor car, a Ford, into the Naga country. The Nagas were profoundly impressed. They looked at it sideways, in front, and from the rear; crawled underneath it; sat inside and on the bonnet. Then held a long pow vow before telling Little: 'It is a very good gharry, very good indeed, but nothing like so good as a steam roller.'

Dr. B. Ch. Chhabra said :—

I would draw attention to the term 'Nāga' as the designation of a tribe as well as of a mountain. The form 'Nānga' also occurs. As

regards its derivation, it is connected with the Sanskrit words *nāga* 'serpent' and *nagna*, 'naked'. Most people prefer the latter explanation, perhaps thinking that it refers to the habit of the people, going about naked or almost naked.

The term *Nānga* can also be a corrupted form of the Sanskrit word *nāga*, as the vernacular words *meñh*, *māñh* and *bāñh* from Sanskrit *megha*, *māgha* and *bāhu* respectively.

I may point out that Indian History knows of *Nāgas* as ruling dynasties in ancient times. The *Bhāraśivas*, for instance, are also known as the *Nāgas*. In Further India certain royal dynasties trace their origin from a *Nāgī* princess.

In view of these considerations I would ask whether we have not in the present term a relic of a forgotten dynasty called the *nāgas*.

Rai Bahadur *Ramaprasad Chanda* remarked :—

The Sanskrit word *Nagna*, naked, does not only mean those who go naked, but also persons with inferior culture or false religion.

Dr. *Prashad* replied to the various speakers.

Mr. *Hobbs* observed :—

Dr. *Prashad*, in the course of his summing up denied my statement about 'bagpipes'. I would point out that I said 'pipes', because the tone and the irregular musical intervals are, or were, reminiscent of the Scottish pipes.

#### MAY, 1935.

On account of the Royal Jubilee celebrations no Ordinary Monthly Meeting was held.

#### JUNE, 1935.

An Ordinary Monthly Meeting of the Asiatic Society of Bengal was held on Monday, the 3rd, at 5-30 P.M.

#### PRESENT.

SIR DAVID EZRA, Kt., F.Z.S., Vice-President, in the Chair.

#### Members :

Bent, Mr. W. A.	Chattopadhyaya, Mr. K. P.
Bose, Mr. M. M.	Dey, Mr. Mukul
Chanda, R.B. R.	Mamun, Mr. Johan van
	Singh, Mr. Sarabjit

#### Visitors :

Ambler, Capt. G. M.	Chatterjee, Dr. Marcel
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The minutes of the last meeting were read and confirmed.

Before proceeding to the further business of the evening the Chairman drew the attention of the meeting to the very pleasant

fact that in the Honours List published at the occasion of His Majesty's birthday, the name of the President of the Asiatic Society of Bengal was included as the recipient of a Knighthood. He felt that every member of the Society would feel grateful on account of the honour bestowed on Dr. L. L. Fermor and he proposed that the General Secretary should send a telegram of congratulation to Sir Lewis Fermor on behalf of the meeting.

The proposal was accepted by acclamation.

The General Secretary reported receipt of twelve presentations of books, etc., which had been placed on the table for inspection.

The General Secretary announced that the following candidates would be balloted for election as Ordinary Members :—

(15) *Singhania, Raghunath Prasad*, Vidyabhusan-Visarad, Secretary, Rajasthan Research Society, 27, Baranoshi Ghose Street, Simla, Calcutta.

Proposer : O. C. Gangoly.

Seconder : R. Chanda.

(16) *Sen, Bhupati Mohan*, M.Sc. (Cal.), M.A. (Cantab.), Indian Educational Service, Principal, Presidency College, 20-A, Mayfair, Ballygunge, Calcutta.

Proposer : Sir U. N. Brahmachari.

Seconder : S. L. Hora.

The General Secretary reported the following loss of membership, since the previous meeting, by death :—

(2) H. A. Giles (An Honorary Fellow, 1917).

(3) Rev. H. Hosten, S.J. (An Associate Member, 1910).

(4) Vishwanath Vasu (An Ordinary Member, 1934).

(5) L. N. Rai (An Ordinary Member, 1928).

(6) A. G. Lunan (An Ordinary Member, 1929).

The General Secretary reported the following loss of membership, since the previous meeting, by resignation :—

(6) Saradindu Mukherjee (An Ordinary Member, 1924).

(7) A. N. Mukherjee (An Ordinary Member, 1926).

(8) Rev. F. B. Fisher (An Ordinary Member, 1929).

(9) S. K. Ahmad (An Ordinary Member, 1930).

(10) Bhabadeb Mookerjee (An Ordinary Member, 1928).

(11) Sir C. V. Raman (An Ordinary Fellow, 1925).

(12) Nilmoni Chakravarti (An Ordinary Member, 1909).

The General Secretary reported that there had been no lapses of election, since the previous meeting, under Rule 9.

The General Secretary reported that there had been no withdrawals of application, since the previous meeting.

In accordance with Rule 38, the General Secretary announced that the names of the following Ordinary Members would be suspended as defaulters within the Society's building for the period of a month to be removed from the Society's registers for

non-payment unless the amount due be paid before the next Ordinary Monthly Meeting :—

G. N. Bose Mullick

Dr. Mircea Eliade

G. S. Kewal

S. B. S. W. Laden La

P. V. Ramanujaswami

S. K. Roy

D. L. Clendenin

P. K. Das

Raja K. Deb, Rai Mahasai

J. J. Mahudavala

In accordance with Rule 48(a), the General Secretary reported that the Council, since the last Ordinary Monthly Meeting, had adopted the following Regulations regarding the award of 'Pramatha Nath Bose Memorial Medal'.

#### REGULATIONS REGARDING THE AWARD OF THE PRAMATHA NATH BOSE MEMORIAL MEDAL.

(1) The Medal shall be awarded every three years at the Ordinary Annual Meeting of the Asiatic Society of Bengal in February.

(2) The Medal shall be bestowed on a person who, in the opinion of the Council has made conspicuously important contributions to practical or theoretical Geology with special reference to Asia.

(3) The General Secretary shall at a meeting of the Council preceding the Ordinary Meeting in November place before the meeting the names of at least three Geological Experts and three members of the Society for consideration.

The Council shall then proceed to appoint an Advisory Board of not less than three members selected from the list placed before them provided that the Council, for special reasons, shall be entitled to select persons outside the list. The Advisory Board shall always include two Geological Experts and the General Secretary shall be an ex-officio member of the Board.

(4) The Advisory Board shall be termed 'The Pramatha Nath Bose Memorial Medal Advisory Board'. The Board shall appoint a Chairman from amongst its members who shall have a casting vote (in addition to his own vote) in the event of the number of votes being equally divided.

(5) The General Secretary shall call a meeting of the Advisory Board on the first convenient date subsequent to the first Monday of December, at the same time requesting members to bring with them to the meeting a detailed statement of the work or attainments of such candidates as they may wish to propose. The General Secretary shall also place before the Board for consideration detailed statements of the work or attainments of any other candidate submitted by any Fellow of the Society. The Board shall make such arrangements as may be necessary for the selection of a name to be submitted to the Council at their December meeting.

(6) Notwithstanding anything determined in these Regulations, it shall be within the competence of the Board to abstain from the selection of a name, in which case, provided the Council concurs, the award for the year shall lapse and shall be postponed to the next following year to be determined in the manner prescribed in the above rules, and, if necessary, deferred again year by year, until an award be made, the period mentioned in Rule 1 in such case to be reckoned from the date of the award.

The following papers were presented :—

1. JOGENDRA CHANDRA GHOSH.—*Ekānamśā and Subhadrā*.

The author has made an attempt in this paper to answer (1) How and when Durgā came to be called Ekānamśā ; (2) How she



came to be associated with and worshipped along with Baladeva and Kṛṣṇa ; and (3) How and when her name came to be changed to Subhadrā.

Etymology of the word Ekānamśā. Mention of Ekānamśā in iconography in the *Bṛhatsamhitā*. Varāhamihira's description relating to Ekānamśā in his chapter on Pratiṃlākṣaṇa.

Criticism of Rai Bahadur Prayag Dayal's identification of Lakṣmaṇa in his account of *Important Sculptures added to the Provincial Museum, Lucknow, during the last Decade*, in the *Journal of the U.P. Historical Society*, Vol. VIII. Part II, 1934.

### Conclusions.

In the absence of the author the paper was taken as read.

### 2. K. P. CHATTOPADHYAY.—*The Caḍak Festival*.

The Caḍak festival is associated with the vernal equinox. The ceremony begins a week before the end of the month of Caitra (March-April) and culminates on the last day of that month, which also marks the close of the year in Bengal. This date is known as the day of the passing of the sun into Aries (Mahāviṣuva saṃkrānti). Actually it comes after the day of the vernal equinox by about three weeks. The name, however, indicates clearly the association with the equinoctial day which once did coincide with this date. The end of the year in Bengal appears in course of time to have lagged behind to this extent. The traditional origin of the festival is that on this date king Vāṇa in order to please Mahādeva, drew blood from his body as an offering and propitiated him by dances (along with friends) which are favoured by him.

Conclusion : The Māṇḍa festival, the Caḍak and Dharma worship are closely connected, identical in many respects and have a common origin. They are all based on a belief in resurrection, or coming to life after death, and are intended to be celebrated annually to secure the return to life of the deceased members of the community.

Mr. Chattopadhyay explained that for his communication to the meeting he would limit himself to two or three salient points without going into details which the paper, when printed, would place before the readers. He would only limit himself to the following remarks.

In a previous paper he had published in the *Journal of the Society* a description of the Māṇḍa festival as it is found in Chota Nagpur. The Caḍak festival, now described, is comparable to the Māṇḍa Celebration. The latter was observed in 1934 during the last week of Caitra in different places in Calcutta and suburbs. In this Caḍak festival the deity worshipped is Śiva, or Mahādeva. The place of worship is generally a temporary thatched hut facing the south. An earthen image of a crocodile with a male child between its jaws is also built on the ground to the east of the hut. The crocodile is associated with the offerings to the Sun. The following special ceremonies are performed by the devotees on different days :—

- (1) swinging over fire,
- (2) falling on thorns,

- (3) jumping on knives,
- (4) piercing the skin, with arrows,
- (5) the marriage of Śiva ; and the fire dance,
- (6) swinging on the Cadak tree,
- (7) the propitiation of the resuscitated ghosts.

He also wished to give expression to his opinion that the festival was of exceedingly remote origin.

Mr. M. M. Bose remarked :—

The word 'Carak', it appears, is derived from the Sanskrit 'Cakra' or wheel, that is 'wheel of time'. The festival is connected with the end of the old year and the beginning of the new year. A year means a single revolution of the wheel of time and this is celebrated by revolving the 'carak' wheel, and Śiva or Mahākāla—the great God of Time—God of destruction and resurrection, is worshipped in this connection. In several parts of India the year ends with Kārtika Amāvasyā—when the Dipāvali festival is celebrated and Mahākālī or the great Goddess of Time is worshipped. I doubt very much if these festivals are of non-Aryan origin as suggested by the lecturer. More proofs are necessary before this suggestion can be accepted.

Mr. Van Manen inquired whether the speaker meant to imply that he regarded the ceremony as of aboriginal origin, adapted to Hinduism, or as of ancient Hinduic origin?

The speaker replied that he considered the origin to be pre-Vedic, but that he regarded the expression Hinduism as an undefined term and so preferred to let the matter remain where it was.

3. G. M. AMBLER.—*A Vocabulary of the Mawkhen. Salon, or Sea-Gipsy Language of the Mergui Archipelago.*

An attempt has been made to draw up a vocabulary of the Mawkhen language of sea-gipsies who inhabit the Mergui Archipelago, where the author has collected materials during his visits in 1932-33. The materials prepared by him were collected and tested with the help of two Mawkhens who were members of the crew of the author's vessel.

The Mergui Archipelago, on the coast of Lower Burma, consists of 804 islands varying in size. The Salons (Mawkhens) are a very primitive people who inhabit this archipelago and are gradually dying out. Till now the only records of them have been obtained from the 'civilized' members of the tribe, and very little appears to have been published on this insignificant group of Indonesians and their language.

The vocabulary is a double one: Salon-English, and English-Salon. It contains some 400 words apart from the numerals, the names of relationships and a number of short sentences.

A brief introductory description of the Mergui Archipelago is added.

The speaker invited his audience to accompany him to the coast of Lower Burma, from Tavoy, which lies south of Moulmein, to VICTORIA POINT, the most southerly point of Burma which here meets the north-west frontier of Siam.

In this area are three notable ports of call for regular steamship services :—

Tavoy : a port situated, inland, up the Tavoy river from where interior produce is exported.

Mergui : a coastal port, headquarters of the Mergui administrative division, noted for its pearl fisheries, tin and general produce.

Victoria Point : the most southernly port in Burma, with an aerodrome and airways service.

Along this coast, and in the above area is a group of over 800 islands, from mere rocky pinnacles rising sheer out of the sea, to substantial islands like St. Matthews, which is 16 miles long by 6 miles broad, with a mountain peak 3,000 feet high near the south centre ; Kissersaig Island, 18 miles by 10 miles ; the most fertile island in the Group ; Elphinstone Island, 12 miles by 6 miles.

The majority of the islands are covered with dense, tropical virgin jungle and are uninhabited.

These islands are known as the Mergui Archipelago, and it is in this area that this strange tribe is found, variously called 'Selung', 'Salon', 'Sea-Gipsy', 'Orang Laut', 'Orang Sletar', 'Orang Kayang'. In their own language these people term themselves 'Mawkhon' which, literally translated means the 'Drowned people'.

These Mawkhon live all their lives in boats called by them 'Kabang', of most original construction unlike any type of vessel to which we are accustomed.

A log is hollowed out to form the keel, and the sides are heightened by the addition of palm stems and bamboos, laid horizontally along the gunwale, the whole lashed with jungle fibre and caulked with the nest of the dammer bee worked up with Gurjan oil and rosin, all locally available in the forest. Not a single iron nail is used throughout.

In these Kabangs the Mawkhon roam from island to island, fishing and occasionally hunting deer and pig with the aid of the innumerable pariah dogs that live with them in their boats.

The Mawkhens do not practice agriculture. They eke out their diet of fish and flesh by the addition of roots and herbs of which there is a plentiful supply on the islands.

The Mawkhens do not build houses, except a few who have been induced to settle in Victoria Point, who have rough sheds on stilt, in the tidal flats. For shelter they have mats made of the dunnoe palm which they erect on their boats or on shore when necessary.

The Tribal Classification has not yet been definitely settled, though, for the present these people are classified as Austronesians.

The Mawkhon language does not appear to bear affinity to any known language but has a number of words that are evidently borrowed from Malay, Siamese and the Chams of Cambodia.

These people are extremely timid and at a very primitive stage of civilization. They have quite a wealth of folk-lore but no real history. They believe in ghosts, evil spirits and the continuation of life after death on another planet. They have a very hazy haphazard idea of a Supreme Being whom they term Thoida, but appear to have no real form of worship. They stand in great awe of their witch doctors (Micha-Blen) and of the magic spells they are supposed to be able to cast. The speaker stated that he intended shortly to go out again to obtain fuller details of their folk-lore, customs, and language.

After the reading of the papers, the following exhibit was shown and commented upon :—

1. SARABJIT SINGH.—*Tobacco Pipes and other objects from the Naga Hills, Assam.*

At the last meeting of the Society Dr. Baini Prashad exhibited ethnological specimens from the Naga Hills and made some observations on certain tribes of the Nagas and the country inhabited by them. The present exhibitor accompanied Dr. Prashad in his tour to the Naga country with the object of making an ethnological collection and studying the physical anthropology of the people.

The specimens of tobacco pipes exhibited were procured from the Angami, Sema, and Ao tribes. Samples of ear-ornaments of men and women, as well as two interesting types of musical instruments were also exhibited.

Mr. Singh explained his exhibit as follows :—

Most Nagas, whether men or women, are inveterate smokers, and even children start smoking at a fairly early age. A specimen of the plant, the leaves of which are generally used for smoking by the Nagas, was kindly identified by the authorities of the Botanical Survey of India as *Nicotiana tabacum* Linn. The leaves of this plant are prepared for smoking by being half dried in the sun and are thereafter rolled up with the feet into thin bundles. Such crudely prepared tobacco is kept alight by means of a piece of live charcoal placed in the bowl of the pipe. In general two types of smoking are practised by the Nagas : (1) dry smoking, and (2) smoking through water. In the latter case the smoke, before being inhaled, passes through a bowl of water which is attached at the base of the smoking pipe.

The simplest and most common type of dry-smoking pipe consists of a small piece of bamboo cut immediately below a node : this serves as the bowl for the tobacco, while another thin bamboo stem fixed into it at an angle slightly less than a right angle serves as the mouth-piece through which the smoke is inhaled. Amongst the Ao Nagas the mouth-piece stem is often decorated with bindings of cane, sometimes dyed red and woven up into elaborate patterns. The pipes of the Aos and Semas differ both in design and form, but the basic idea is identical.

The eastern Angamis and Semas generally use a pipe in which the smoke, before being inhaled, filters through a bowl of water. The receptacle for the tobacco is carved out of a soft grey stone and this is attached to the vertical bamboo or wooden stem fixed into the water receptacle at the base. The main stem dips into the water, while the side mouth-piece, through which the smoke is inhaled, sticks out just above the water level. The majority of the nicotine content of the smoke as it passes through the water is held back, and the water, therefore, before long becomes quite discoloured and saturated with nicotine. This nicotine water is later taken out and stored in bamboo or gourd phials which are carried by the Nagas tucked in their waist belts. Nagas take sips of this nicotine beverage from time to time while working in the rice fields or marching through the country. *En passant* it may be mentioned that it is one of the most important duties of the housewives to collect nicotine water for their husbands. According to the speaker's personal observation the liquid is never swallowed, but another observer records differently. According to Col. Wood, I.M.S. (*Journal of the Natural History Society, Darjeeling*) 'this nicotine drinking seems to have no deteriorating effect on the system except that it pigments the skin'. The skin of an addict to nicotine drinking, according to Col. Wood, takes on a complexion approaching the colour of a good, old seasoned meerschaum. In some cases for maturing the nicotine water tobacco ash from the bowl is also added to the water in the bowl, as it is believed that this makes the nicotine water ready for use in a much shorter time.

The Chairman announced the result of the ballot for the election of Ordinary Members and declared all candidates duly elected.

The Chairman announced that no meeting of the Medical Section had been arranged to be held during the current month.



### JULY, 1935.

An Ordinary Monthly Meeting of the Asiatic Society of Bengal was held on Monday, the 1st, at 5-30 P.M.,

### PRESENT.

SIR DAVID EZRA. KT., F.Z.S., Vice-President, in the Chair.

#### *Members :*

Bogdanov, Mr. L.	Groth, Mr. E. M.
Bose, Mr. M. M.	Heron, Dr. A. M.
Chakladar, Mr. H. C.	Hobbs, Mr. H.
Chakravarti, Mr. C.	Ledrus, Rev. M., S.J.
Chattopadhyay, Mr. K. P.	Manen, Mr. Johan van
Driver, Mr. D. C.	Singh, Mr. S.
	Vidyabhusana, Prof. A. C.

#### *Visitors :*

Banerjee, Mr. Kalachand	Das Gupta, Mr. C. C.
	Giskra, Baroness

The minutes of the last meeting were read and confirmed.

The General Secretary reported receipt of six presentations of books, etc., which had been placed on the table for inspection.

The General Secretary reported that there had been no applications for membership, since the previous meeting.

The General Secretary reported that there had been no loss of membership, since the previous meeting, by death.

The General Secretary reported the following loss of membership, since the previous meeting, by resignation :—

- (13) Mathura Nath Mitra (An Ordinary Member, 1929).
- (14) Sir J. C. Coyajee (An Ordinary Member, 1925).
- (15) R. B. Khambata (An Ordinary Member, 1926).

The General Secretary reported that there had been no lapses of election, since the previous meeting, under Rule 9.

In accordance with Rule 38, the General Secretary announced that the names of the following ten Ordinary Members, who had, since the last meeting, been suspended as defaulters within the Society's building, had now been removed as defaulters from the Society's registers for non-payment of dues :—

G. N. Bose-Mullick  
G. S. Kewal  
P. V. Ramanujaswami  
Raja K. Deb, Rai Mahasai  
D. L. Clendenin

Mircea Eliade  
S.B. S. W. Laden La  
S. K. Roy  
P. K. Das  
J. J. Mahudavala

The following papers were presented :—

1. S. N. CHAKRAVARTI.—*Two Inscriptions from Barakar.*

These two inscriptions are found on the right door-jamb of the Gaṇeśa temple in the Begunia group of four temples at Barakar in the Burdwan District. Previous literature. Dates Śaka 1382=A.D. 1461, and Śaka 1768=1846. The author believes that on palæographical grounds Śaka 1468 or 1498 seems to be preferred. Detailed palæographical discussion. Transcription. Translation.

In the absence of the author the paper was taken as read.

2. K. P. CHATTOPADHYAY.—*History of Indian Social Organization.*

If the social organization of India be examined, the first thing that strikes the observer is the peculiar system of endogamy combined with exogamy, running through the whole system, among the vast population of the country. It is also noted at once that the giving of food and drink or acceptance thereof, between different social groups, depends on certain ideas of purity associated with the groups.

Some people, it will be found, are considered very pure ; and food and drink touched by them, or prepared by them, are accepted by all (with a few exceptions). They are the Brahmans proper.

These people in their turn accept water and certain kinds of food from only some of the other social units, called jāti or castes. These other groups are in general served by the Brahmans, as priests, though not by their highest sub-division.

There are other castes from which Brahmans do not accept food or drink but which at the same time are not regarded as very impure, and are entitled to certain social privileges. Finally there are the castes which are considered vile.

In general, it is found that the artisans and traders belong to the group which is considered fairly pure by the Brahmans ; while the lowest group is formed by scavengers, menials, and people who follow such humble occupations as basket-making.

In order to explain, in the scientific sense, how such a system might have risen, we shall have to examine, in detail, the entire social organization. We shall also have to investigate how far the researches of ancient and modern workers in this field have contributed to clarify the issues.

The author therefore examines the various theories concerning the origin of castes and also the factors in caste development, as follows :—

The major conclusions may be briefly summarized as follows :—

- (i) An immigration of one or more cultured peoples, laying stress on household exogamy, and not on paternity, leading to a growth of matrilineal society of different types under different conditions, with anomalous kin marriage.
- (ii) Interaction of matrilineal people from different areas leading to further changes.
- (iii) Immigration of a patrilineal people leading to cross-cousin marriage, along with mother-right but giving an appearance of father-right in case of patrilocal residence ; and elsewhere imparting strongly patrilineal traditions.
- (iv) A final cultural domination by a patriarchal people.

Alliances between different groups, and bitter struggles, appear to have taken place before some kind of equilibrium was reached, and the caste system with its complex structure evolved as a stable form of social organization.

Mr. K. P. *Chattopadhyay* stated that the paper was too big to be read out in its entirety. He would therefore summarize the arguments and conclusions.

The characteristics of Indian caste had to some extent been noted in the agenda paper. The writer pointed out that the caste system shows two kinds of divisions :—

1. A horizontal stratification finding expression in barriers to (a) marriage, (b) taking food of certain kinds, and (c) accepting water from those at lower levels. Certain occupations are restricted to each of the levels.

2. A vertical division which splits up each horizontal stratum into a number of compartments separated by bars against (a) intermarriage and to some extent (b) interdining. Certain occupations are definitely reserved for certain of these groups.

The early hypothesis put forward by the authors of the Hindu *Dharmaśāstras* was noted. Next the theories of modern writers like Ibbetson, Nesfield, Risley and Sénart were discussed and criticized. Ibbetson failed to explain how the system grew up. He merely noted the tribal basis of some of the castes in the Punjab, and ascribed the complications of the caste hierarchy to Brahmanic and priestly interference. Nesfield attributed the origin of the caste system to the evolution of the arts. He failed to note that some of the arts and crafts practised in the lower strata of society are quite complicated ; also the order of precedence varies from province to province. Other features of the caste system were not taken into account, or simply ascribed to priestly influence. Risley tried to explain the caste organization by the colour difference and consequent (alleged) enmity between the pre-vedic invaders and the earlier dark-skinned and uncultured people. Risley's conclusions are supported neither by the rules governing intermarriage or intermixture of races as found in the *Dharmaśāstras*, nor by the physical measurements of ethnic provinces. The instance of a highly developed

pre-vedic culture in India was unknown to him. The author further pointed out that a stream of cultured immigrants, of fair skin and fine features, had penetrated to Nepal and built up the Newar culture, passing through Northern India and mixing with the earlier black-skinned people on the way. Yet caste had not developed. Further, the colour difference was sharper in Africa. Yet the home of caste was India, not Africa.

M. S  nart took into account the different viewpoints of these earlier theorists and also brought to bear on the problem his knowledge of early European social organizations and practices. He suggested that the uniqueness of caste in India was due to the physical isolation of the country, combined with the other factors. Parallel developments had taken place in early Greece and Rome but the social groups had not crystallized into castes. In India, the vastness of the country and the physical isolation of the peninsula, led to a rigid form of society.

S  nart overlooked the existence of a pre-vedic high level of culture ; and the fact that the caste structure, while similar in general nature, varies somewhat peculiarly in the different provinces with regard to purity or impurity of certain groups of castes. The fact that caste was not formed in Nepal or other outlying areas, indicates that physical isolation is not sufficient to lead to caste formation under the conditions noted by S  nart.

Recently Dr. Hutton has put forward the view that the necessary factor for caste segregation is to be found in special magical qualities peculiar to certain social groups as found in the Naga Hills. He has concluded that the fear of *mana* (as he terms it) of one group working harm on, or neutralizing, the *mana* of another group, has been responsible for isolation of castes in India. The author however pointed out, by quoting from the writings of Dr. Hutton himself, that the said social groups in the Naga Hills have no bar on intermarriage or interdining. The bar is with regard to occupation. The facts noted by Dr. Hutton are linked up really with the social unit "the household" and were explained by the author on the basis of household exogamy. The developed forms of exactly similar customs in orthodox Hindu society were noted and it was shown how both groups of facts fit in the same general explanation, which is different from that of Dr. Hutton.

The author then considered the different factors that promote solidarity of social groups or lead to their disruption and isolation in the case of contact of people. After discussion the various factors, (a) economic, (b) religious, (c) social, and (d) political, the author came to the conclusion that the economic rivalry of two or more different sets of cultured immigrants, competing for dominance, and influence with the earliest or earlier comparatively uncultured people, has been the most important factor in the isolation of social groups in India. If the competing group had, each of them, superior knowledge of certain arts and crafts, these would be jealously guarded; intermarriage and interdining among the groups of their friends, the semi-civilized people of mixed descent, would be discouraged (and also abstained from) by the groups themselves in their own interest. If in addition the gods were different, the rules of sexual relations opposed, and the food also varied, the contempt and hatred for each other arising out of economic rivalry would be further intensified and would make social isolation complete. Difference of colour and the vastness of the country would be additional factors promoting it.

When some sort of equilibrium was reached, a survey would be made. To such an observer of ancient times, the important factor in determining social position would be (a) the affiliation to this or that social group of cultured immigrants, and (b) admixture of blood in patrilineal or matrilineal line, with aborigines or immigrants. These questions in fact bulk large in the Hindu *Dharma  stra* in discussions of caste hierarchy.

Further, if one group of immigrants and their friends obtained mastery in one place, and the other group in another, while some kind of



compromise was arrived at in a third area, perhaps in the face of a common enemy, the relative position of the different social groups would vary from one such province to another.

The detailed analysis so far made is in agreement with the theory put forward in this paper. The conclusions regarding immigrations of cultured people and the results of their contact were summarized and were noted in the agenda paper.

Mr. M. M. Bose remarked :—

We are thankful to Mr. Chattopadhyay for taking up such an interesting subject as the history of Indian Social Organization. It is evident from the summary that he has given and from the portions of the paper read out by him that his treatment of the subject has been very ample. It also shows that he is gifted with much power of independent thinking as well as a large fund of imagination. But on such a vast subject there is necessarily much room for difference of opinion. It would not be fair to discuss these differences at this stage. We are eagerly awaiting the publication of his paper and then it will be time to offer any criticisms called for.

### 3. CHARU CHANDRA DAS GUPTA.—*A few types of Sedentary Games from Bihar.*

The author, while on an archæological tour in Bihar and the United Provinces in 1934, collected accounts of different sedentary games. He briefly describes and discusses eight such games not yet noticed by previous investigators. The names of the games are :—

- |                |                           |
|----------------|---------------------------|
| 1. Bāra-guṭi.  | 5. Biś-guṭiyā.            |
| 2. Nāo-guṭiyā. | 6. Bāra-guṭiyā.           |
| 3. Bāghā-guṭi. | 7. Nāo-guṭiyā-baiṭhānekā. |
| 4. Rām-tir.    | 8. Sāt-gharoyā.           |

Mr. Das Gupta briefly described the nature of the eight games.

Dr. A. M. Heron remarked :—It may be asked what interest grown up and learned people can have in studying these simple games played by children or simple people. I would like to draw attention to the excellent analysis of what such games are as found in the great *Encyclopædia of Religion and Ethics*. The matter is so well and so tersely put that the extract bears reading out in full. The writer of the article (E. Sidney Hartland) says :—‘A game is an organised occupation, undertaken by two or more persons, the primary intention of which is not utility but pleasure or pastime by means of the exhibition of the skill or good fortune of the players. It proceeds according to definite rules, and sometimes necessitates special instruments or apparatus. Games may be broadly divided into three classes—games of skill, games of chance, and games of imitation. The rules of games of skill are framed to bring out the various qualities, physical, mental, or moral—strength, agility, quickness of the senses, rapidity of calculation and induction, endurance, patience, and so on—of the players. Games of chance, on the other hand, regard only the luck of the players, and are decided by events, such as the fall of dice, over which they have no control. The rules, therefore, are arbitrary conventions, designed to emphasize coincidences. Many games combine the elements of chance and skill in varying proportions. In games of imitation the rules are prescribed by the actions to be imitated—limited, however, by certain conventions appropriate to the circumstances of the players; and the result is measured by the verisimilitude of the performance as thus limited. Such games involve the germ of

Drama. Both in games of chance and in those of skill there is contest. In games of imitation there is often little or none ; and the pleasure sought is attained by co-operation, rhythmic movements, and song.

Games as thus defined are social institutions, owing their origin to the inherent restlessness of human beings and the necessity for constant use and practice in order to promote the development and preservation of their physical, mental, and moral powers. They enter very early into the life of the individual, and are of incalculable value in the training of children for graver pursuits of adult years. To the adult—especially the adult savage—they are little less important ; and from the lowest plane of culture upwards, games either in the form of contest or of rhythmic movement (dances), are among the commonest activities'.

Mr. M. M. Bose said :—

Besides the utility of the games mentioned in the *Encyclopædia of Religion and Ethics* as read out by our learned Chairman, it may be pointed out that they also throw light on the character of the people who play them. They are thus of considerable interest from the Social and Anthropological points of view.

The following communication was made :—

1. JOHAN VAN MANEN.—*The word 常 in the Tao Te King.*

The Tao Te King is perhaps the most subtle Chinese philosophic work. It is small in size, consisting in its various recensions of between about 5300 and 5700 characters. Of these characters 105 account together for nearly 3900 of the total. A careful determination of the value of these 105 characters will furnish the basis for the right understanding of the book.

One of these characters is Ch'ang which occurs 31 times. For this one word even the most qualified translators have used a great number of synonyms.

Julien has : eternal, eternally, constant, constantly, constancy, always, unchangeable and enlightened. Legge has : enduring-and-unchanging, constant, constantly, always, ever, regular-unchanging-rule, in-its-regular-course, invariable, unchanging. Others, such as von Strauss, de Harlez, Parker, Grill, Wilhelm, Wieger, vary similarly or more. The *dii minores* are generally worse.

The question is to find a single European word which fits all passages.

The fundamental conception seems to be 'invariable (in manifestation)'. Constant in English does not quite fit everywhere but its equivalent in Latin might perhaps do. 'Eternal' goes beyond the meaning, amongst others because there is no question of time, but of manner. A German word that has been suggested is 'beharrlich' (von Strauss, Weiss). A Latin equivalent might perhaps be 'jugis'. A Sanskrit equivalent is 'nitya', though the latter term has also been wrongly confused with eternal or permanent in European translations. A very near English concept is 'steady', though this word is too colloquial for application in all passages. The same applies to German 'fest' or Dutch 'vast'. German *stāt*, *stets*, *beständig*,

approach it. Semasiologically or pictographically the Chinese term is probably equivalent to 'standard', but this English word cannot without strain be used in all contexts. What is necessary is to find a term which is the philosophical and solemn equivalent of the more practical and common 'steady' or 'stable', in other words a single term for 'tranquillus saevis in undis', or for 'constancy throughout fleeting and changing appearances'.

Serene and untroubled may also be thought of.

Mr. Van Manen said that the problem of translation was a major subject by itself with an extensive literature. He would not set out the theory of this problem but deal only with the specific instance offered by the Tao Te King. The subject was thus narrowed to the fourth degree: translation in general; from the Chinese; from an archaic period, about 500 B.C.; of so distinctive and individualistic a writer as Lao Tse. He would for the moment accept the traditional view of the authorship and date of the Tao Te King. Since the first anonymous translation into Latin, presumably by a Jesuit priest, and probably dating from about 1788 (a translation not yet published), about 50 European translators have rendered the complete text. Besides, dictionaries, grammars and anthologies, as well as essays and works on Chinese religion, contain a large number of isolated fragments translated in addition.

The translations are of most unequal value and authority. They may be grouped into four main classes. First those of professional sinologists, some 20 in number. Next, those by serious students of religion or philosophy who had studied this special text *ad hoc*, about 12 in number. Thirdly, translators of previous translations from one European language into another, only a few. Fourthly, those of the amateurs, a most diverse group made up by a few serious and capable enthusiasts or dilettantes in the original good sense of the word but containing artists, cranks, idealists, individualists, intuitionists, occultists, phantasts, sentimentalists, syncretists and theosophists, of every hue and quality.

Amongst all these groups there is a bewildering variety of merit and demerit. Not all sinologists had given consistently good work and not all dilettantes consistently bad work. A case in point is where one single non-sinologist had given the correct rendering against a mistaken one of all 49 others, professionals included. Amongst the professionals the speaker preferred on the whole, as a basis for further study, Stanislas Julien (as a grammarian, not as a philosopher), James Legge (for scholarly honesty, but not for beauty or spirit), Carus (for journalistic flair and handy typographical disposition), Richard Wilhelm (for a spiritedness and generally high level of feeling).

The translations of de Harlez and Wieger he considered as very unequal, free and unreliable in spots, but also containing isolated happy or suggestive renderings. De Groot, great scholar though he was in his own line, has been responsible for some very queer interpretations.

In the second group he found useful matter in von Strauss (many of whose improvements had been lost again by subsequent workers), Grill, Ular (some brilliant isolated points, but, especially in the German edition, a notable attempt to do justice to the rhythmic structure of the text, neglected by nearly all others), and some others.

In the dilettante group the translation by de Pouvoirville (and its subsequent re-translation into Bulgarian) was something between a bad joke and a tragedy; the one by Mac Innes something of a like nature; the one by Dallago haughty and entirely lacking in perspective of the task. From some of the others here and there something useful—perhaps not so very much, but not unimportant—might be gleaned. Konissi's Russian translation was somewhat of curiosity: 'Tolstoi collated my

translation with those in English, German and French, and settled the text of every chapter'.

The artists represented amongst the translators contributed some lessons in the rendering of the formal beauty of the original.

A future serious study of the Tao Te King, after the termination of the first century of European effort at understanding the book, would no longer be able to dispense with a rigidly philological, as against a purely grammatical study of the text. In Chinese philology there was an almost complete absence of what the Germans call philological 'Vorarbeiten', preliminary studies and investigations, with regard to ancient Taoism. Books like Teichmüller's *Neue Studien zur Geschichte der Begriffe* with regard to Heraclitus, do not exist with regard to Lao Tsze.

The surviving remnants of Heraclitus aggregate to perhaps one-fifth of the extent of the Tao Te King. But what a contrast between the nature of the literature concerning Lao Tsze and that concerning Heraclitus! On the one hand a laborious quest for essentials and precise definition, on the other a profusion of polite amiabilities and ethical platitudes, with here and there some historical fact thrown in. In the one case a dialectical and philosophical treatment, on the other a predominantly grammatical one with moralising added. We had, however, not to overlook what von Strauss, Grill and Dvořák have contributed in this direction. Even von Plaenckner's intuitions went in the right direction, however completely his results have been damned by scholarship. Ethically his contribution has value. Borel has done sentimental and artistic justice to some terms, as Haas, Medhurst and others have done theologically. But a complete critical valuation of all workers would lead too far.

As set forth in the preamble to the communication, about one hundred Chinese words constitute the marrow of the Tao Te King. These have to be studied intensively. As a preliminary we need a work like Jacob's concordance to the Upanishads or Haas' concordance to the Bhagavad Gītā. The speaker had compiled such a concordance for himself. There exists a Chinese one which he had not been able to obtain. (Lao chieh Lao, by Ts'ai T'ing-kan, Shanghai, 1922.) He had solved to his satisfaction the specific meaning of a dozen Chinese words in Lao Tsze's usage which had led him to what he considered new and important conclusions. He did not maintain that a Chinese word in the Tao Te King should be indiscriminately or mechanically compared in all its occurrences. There were at least five distinct levels of use of words in the Tao Te King. First, there is the ordinary meaning of ordinary use. Second, there is the modified meaning when used in a binom. For instance it seemed to him, that the whole elaborate discussion concerning the meaning of the

term 無爲 finds its very simple solution by understanding the binom

not as non-action but as quiet, restful, reposeful, or even unobtrusive. Third, there is the use of archaisms peculiar to Lao Tsze. Fourth, there are traces of forgotten idioms. Fifth, there is the use in rhythmical utterances which may perhaps prove to be oracular quotations in a language not that of Lao Tsze himself.

Now coming to the immediate subject announced in the title of his communication, the speaker stated that he had drawn up a comparative table of the translation of the word ch'ang (occurring 31 times) in the renderings of some 20 different translators. It had to be noted that

the word occurred in some places in conjunction with the words 久,

長, and 壽, which caused modification in its meaning. He had arrived at the conclusion that instead of using half a dozen or more different words as the translation of the word ch'ang, one single word should be chosen, as one single conception was intended. This conception was

exactly equivalent to the one expressed by the Sanskrit term *nitya* and, though inelegant, the English word *steady* in its various formal modifications (*steadily*, *steadiness*, etc.), or the German word *beharrlich*, might provisionally be chosen to represent it.

He admitted that he would like to find a still more satisfactory English equivalent. What was however of supreme necessity, was to do away with the present fluctuating way of translation, rendering the majority of single Chinese words each by a great number of different European words throughout this brief, though deep and wise, scripture. After a reliable pattern-translation has been evolved, which will necessarily be artificial, stiff and rigid in the first instance, it will be the task of word-artists to convert the rigid frame into a living and flowing organism with the maximum possible conservation of internal terminological relations.

In the work of translation of texts like the *Tao Te King*, four elements have to co-operate to obtain an ideal measure of success:—

1. Sinology, a capacity to deal with the Chinese language as such, and under the special aspects required.
2. Philology, a capacity to deal with a written text in accordance with scholarly methods and canons.
3. Philosophy, a capacity to deal with conceptions and their relations to the words used to express them.
4. Artistry, a capacity to deal with and to transpose artistic form.

As yet no single scholar showing outstanding capacity in *all* four directions has dealt with the *Tao Te King*. Probably—as genius is rare—a combination of talent would be needed for the production of a really first-class translation of the work.

Mr. K. P. Chattopadhyay remarked that from what he had heard it appeared to him that the word *ch'ang* indicates dynamic invariability, not static immutability. The Indian philosophical term *nitya* conveys this exactly. There are inherent difficulties to translation of philosophic terms from the language of one civilization into that of another. Language develops through linking sound symbols (or pictographs) with mental images. Abstract ideas come to be represented by a process of elimination of concrete associations. A word signifying an abstract idea can convey the particular sense in which it is to be taken only in its proper milieu and to those who are familiar with it. To translate it, that is to say, to replace it by another sound (or similar symbol) belonging to a different culture, it is necessary to get hold of a word used in a similar thought environment. Identity of milieu is rare; hence exact translation is very difficult.

There exists another set of symbols which express ideas without such limitations or restrictions to the milieu in which they have developed. The symbols used in the mathematical sciences, and natural sciences in general, are capable of use, by people of different cultures, without the possibility of misunderstanding ideas. A wider use of such symbols is likely to reduce the difficulties in the way of translation of philosophic works.

The Chairman announced that no meeting of the Medical Section had been arranged to be held during the current month.



## AUGUST, 1935.

An Ordinary Monthly Meeting of the Asiatic Society of Bengal was held on Monday, the 5th, at 5-30 P.M.

## PRESENT.

SIR LEWIS FERMOR, KT., O.B.E., D.Sc. (Lond.), A.R.S.M., M.INST.M.M., F.G.S., F.R.S., F.A.S.B., President, in the Chair.

*Members :*

Auden, Mr. J. B.	Ezra, Sir David
Barwell, Lt.-Col. N.	Fox, Dr. C. S.
Bent, Mr. W. A.	Gee, Mr. E. R.
Bogdanov, Mr. L.	George, Mr. J.
Brahmachari, Sir U. N.	Chose, Mr. T. P.
Brown, Mr. Percy	Heron, Dr. A. M.
Chakravarti, Mr. C.	Hossain, Dr. M. Hidayat
Chatterjee, Mr. P. P.	Hobbs, Mr. H.
Chatterjee, Dr. S. C.	Hora, Dr. S. L.
Chattopadhyay, Mr. K. P.	Jameson, Mr. T. B.
Coulson, Dr. A. L.	Manen, Mr. Johan van
Driver, Mr. D. C.	West, Mr. W. D.

*Visitors :*

Acharji, Mr. M. N.	Fermor, Lady
Bagchi, Mr. D.	Fox, Mrs.
Barwell, Mrs.	Gee, Mrs.
Bose, Mr. H. K.	Hunt, Miss S. D.
Das, Mr. K. N.	Mukerji, Mr. D. D.
	Spencer, Dr. E.

The minutes of the last meeting were read and confirmed.

The General Secretary reported receipt of seven presentations of books, etc., which had been placed on the table for inspection.

The General Secretary drew the attention of those present to the valuable presentation to the Society of a copy of the official German record of the International Policies of the great European Powers from 1871-1914 in 54 volumes together with 9 volumes of summaries and a chronological list of contents. The donor was a member of the Society, Baron Ow-Wachendorf, the local Consul-General for Germany, to whom the Society's grateful thanks had been conveyed.

The following candidate was balloted for for election as an Ordinary Member :—

(17) *Shattock, John Swithun Harvey*, B.A. (Oxon.), I.C.S., Assistant Private Secretary to His Excellency the Governor of Bengal, Government House, Calcutta.

Proposer : A. M. Heron.

Seconder : Johan van Manen.

The General Secretary reported the following loss of membership, since the previous meeting, by death :—

(7) Khan Bahadur Abdul Ghaffar (An Ordinary Member, 1926).

The General Secretary reported the following loss of membership, since the previous meeting, by resignation :—

(16) B. C. Hobbs (An Ordinary Member, 1935).

(17) A. T. Weston (An Ordinary Member, 1934).

(18) Miss Gerta Hertz (An Ordinary Member, 1933).

The General Secretary reported that there had been no lapses of election, since the previous meeting, under Rule 9.

The General Secretary reported that there had been no withdrawals of applications since the previous meeting.

The Chairman announced the result of the ballot for the election of an Ordinary Member and declared that the candidate had been duly elected.

The Chairman announced that no meeting of the Medical Section had as yet been arranged to be held during the current month.

The Chairman announced that there would be an Ordinary Monthly Meeting in the recess month of September, as usual on the first Monday, the 2nd, of the month.

The following papers were presented :—

1. CHINTAHARAN CHAKRAVARTI.—*The Cult of Kālārkarudra (Cadaka-pūjā)*.

The paper notices the characteristic features of the worship of the Śivaite deity Kālārkarudra who, along with various other little-known deities, is worshipped on the occasion of the Cadaka-pūjā—one of the most important popular festivals of Bengal. Descriptions of these deities as found in different manuals of worship are given and an enquiry is made into the antiquity of these deities, as also of the festivities connected with them, on the basis of references to them in old Indian literature.

Mr. Chintāharan Chakravarti said :—

The festivities and external observances connected with the cult as observed in the month of Caitra (March-April), have already been described by a number of students. The present paper seeks to describe the worship proper, not described as yet, the chief characteristics of which include :—

1. The prominent part taken by non-Brahmins, including members of the lower castes and untouchable communities, in various rituals connected with the cult. It is these people that serve as Sāṅgas, Bālās or Sāiṅs, as they are differently called, and the most interesting piece of their business is the salutation of the deity in various postures to the accompaniment of various tunes of music. It is these people who offer Śivāvali or the sacrifice to the she-jackal in which the service of a Brahmin priest is not required. They also perform the *pāśmāna* or *ghāśmāna*—the pompous bathing of a plank made of the *vilva* tree and a number of cane-creepers bound together—probably symbolic representations of Śiva and Pārvatī.

2. The worship of deities little known to students of Hindu iconography, like Kālārkarudra—the principal deity; Nilacaṇḍī—his female consort; Hājarā, Kedāra, Gambhīra and Nīla. The worship of these two last-mentioned deities appears to have given the names *Gambhīrā* and *Nīlapūjā* to the festivities in some parts of the country.

3. The sacrifice of the goat to the principal deity who appears to represent an aspect of Śiva. Ordinarily the sacrifice of the goat to Śiva is prohibited.

As to the antiquity of the feast it may be pointed out that festivities similar to those observed on the occasion of the *Cadaka-pūjā* are referred to in works like the *Brhaddharmapurāṇa* and in extracts which are attributed to the *Līṅgapurāṇa* and the *Brahmarivarta-Purāṇa*. The principal deity of the cult is described in the *Śaṭkarmadīpikā*—a tantric digest by Kṛṣṇa Vidyāvāgīśa. He is mentioned but not described in the *Kālāgnirudropaniṣad*—a minor Upaniṣad. The *Kālārudratāntṛa*, of which there is a MS. in the Society's Library, refers to the spouse of this deity and she is named *Kālārātri* whose worship is described in many works. The absence of references to the deity or to the festivities in the works of Rāghunandana and Govindānanda (15th-16th centuries) might be regarded as an indication of the fact that the cult was not popular among high-caste people, a survey of whose religious rites and practices is contained in those works.

These rites and festivities may be survivals of similar practices of some sect of the Pāsupatas, some of whose views and practices, which were apparently obnoxious, came in for ridicule and condemnation in such old works as Śaṅkara's commentary on the *Brahmasūtras* and in the writings of the Jains like the *Yaśodharacarita* and the *Bharatakalvātrīmśikā*.

Col. Barwell enquired :—

In view of the time of year suggested (April-May), I am wondering whether something I have myself witnessed in Bengal may not be part of the ritual of this cult. What I have often seen in villages—indeed not far from Calcutta itself—is this : a group of five or six patently low caste people move with a leader and a drummer from one particular kind of tree to another of the same sort. Here, on a signal from the leader, they prostrate themselves head towards the tree stem ; some sort of incantations are pronounced and then some branches (i.e. leaves) are pulled off the tree. This having been done and the branches spread on the ground, they are stamped or danced upon by the worshippers. The party then moves off passing any tree not of the same kind, till another is found when the ceremony of worship and dance is repeated. Can this be a ceremony connected with the cult of *Kālārkarudra* ?

Mr. Chakravarti replied :—

The ritual referred to by Col. Barwell forms part of the elaborate festivities consisting of dances, music, mimicry and various kinds of physical torture observed on this occasion. It is known as *Khājurbhāṅgā* (tearing off the leaves of the datepalm tree) in Faridpur in Eastern Bengal. A group of *Bālās* (devotees) march to the tree. The leader of the party prostrates himself before it, walks around it and embraces it a number of times and offers incense to it. Then he climbs it, spreads out the erect leaves, dances on them, tears off the youngest leaf and plucks bunches of fruits, all to the accompaniment of the beating of the drum and the utterance of incantations. The leaf and fruits are then carried to the place of worship and at the end of the worship are distributed among the people who treasure them as they are believed to avert lightning from the houses in which these are stored. A similar practice in some parts of the country is known as 'Phala-bhāṅgā' "or falling upon the branches of prickly plants spread on the ground".

(See : *An alphabetical list of the feasts and holidays of the Hindus and Muhammadans*—Imperial Record Department, Calcutta, 1914, p. 14.)

Mr. Van Manen said :—

In the June meeting of the Society we had the pleasure of listening to Mr. Chattopadhyay who spoke to us on the *Cadaka* festival in Bengal. The speaker treated the subject from the standpoint of the anthropologist,



describing the ceremonial actions connected with this strange festival. He came to the conclusion that the festival was very old, 'pre-vedic' as he preferred to characterize it. If this conclusion be true the festival and the ceremonial must have a history. In his paper Mr. Chattopadhyay did not deal with this aspect of the subject, but confined himself to a description of present-day practice. Now Mr. Chakravarti has given us a valuable supplement by pointing out that there is a theory connected with the festival, with its own literature, of which he quotes three ritual manuals. Whereas Mr. Chattopadhyay connected himself with the statement that the ceremony is connected with the vernal equinox, Mr. Chakravarti adds that the festival belongs to the cult of a curious triune deity styled Kālārkarudra, i.e., Time, Sun and Storm(?). The two papers complement each other in a most happy manner. It is necessary to have, on the one hand, a correct description of a folkloristic phenomenon as it actually happens, but on the other hand it is equally necessary to attempt to trace the history of such a phenomenon in order to find its rationale. In the non-classical Sanskrit and vernacular literatures many traces are preserved of old cultural traditions which may have greatly changed and perhaps degenerated throughout the course of the ages, and it is to be hoped that in the future many instances will occur of a same happy combination of, first, a careful description on the basis of actual observation of some cultural remnant, and, second, a report on the literary and historical data, placing the observed fact in proper perspective.

Mr. Chakravarti has shown that this Cadak festival consists of two distinct elements of which the one (ceremonial acts) appeals predominantly to the eye, whereas the other (the contents of the spoken word connected with the pūjā) appeals predominantly to the ear. Though the former is more easily appreciated than the latter, the latter is no less important than the former. They represent as it were the inner and outer elements of the entire ceremony. In the first description of the festival the second element was only alluded to, but not described or analyzed. This is one-sidedness, which might easily lead students to wrong conclusions. In the present paper our speaker has supplied the element that was lacking in the previous paper, and the two halves now give a complete picture of the whole, which would not be intelligible if either of the two were lacking. Another point of interest is that Mr. Chakravarti holds that certain general principles, dancing, music, mimicry, and self-torture, are essential to the ceremony, but that the local applications of these vary locally and are therefore accidental.

These two points are important and enter a *caveat*, not only with reference to the premature interpretation of the ceremony discussed this evening, but in analogous cases also.

## 2. M. S. MANI.—*Notes on some Indian Gall-forming Psyllidae (Homoptera).*

In this paper the galls of several species of Psyllids are redescribed. *Megatrioza vitiensis* (Kirkaldy) is recorded as causing the pustule-like galls on leaves of *Eugenia jambolana* (D.C.). *Megatrioza hirsuta* (Craw.) is recorded as causing galls on different species of *Terminalia*, which were previously believed to be produced by Cynips. A partial key to some gall-forming species of the genus *Pauropsylla* (Rubs.) is given. Brief biological notes are also included in a few cases.

In the absence of the author the paper was taken as read.

After the reading of the papers, the following exhibits were shown and commented upon :—

1. A. L. COULSON.—*The Perpeti Meteorite.*

At 11 P.M. on the 14th May, 1935, a meteoric shower occurred in the vicinity of the villages of Perpeti ( $23^{\circ} 19' 30'' : 91^{\circ} 0' 0''$ ), Bhateswar, and Pilgiri under the jurisdiction of the Chandina police station, and near other villages under the police stations of Kachua and Hajiganj, in the Tippera district of Bengal.

Eleven pieces in all were recovered. The total weight of all specimens is 21,942.57 grams; the largest stone weighs 6,689.85 grams. The specific gravity of the meteorite is 3.554. It is being analyzed by Mr. P. C. Roy.

The meteorite, which has been registered as No. 298, Stone, in the collections of the Geological Survey of India, has been classified provisionally as No. 14, White Chondrite (Cw) in Brezina's terminology. It has a white, rather friable mass with few, chiefly white, chondri. It will be described fully in a forthcoming paper in the *Records* of the Geological Survey of India.

The stones are exhibited with the permission of the Director, Geological Survey of India.

Dr. A. L. Coulson said that meteorites are objects of great scientific interest, not only on account of their rarity but also because of their chemical composition. About four falls of meteorites are recorded annually but, making due allowance for the uninhabited areas of the globe and the vast oceanic areas, it has been stated that the average number of meteorite falls cannot be much less than one per *diem*.

The first mention of the Perpeti meteoric shower was in the Calcutta issue of the Bengali paper *Ananda Bazar Patrika* of the 25th May, 1935, in which it was stated that the fall occurred on the 31st Baisakh (14th May) at 11 P.M. in villages under the jurisdiction of the police stations of Chandina, Kachua and Hajiganj in the Tippera District of Bengal. This notice was brought to the attention of the Geological Survey of India by Mr. P. C. Roy, Assistant Curator, and a letter was immediately issued to the District Magistrate of Tippera requesting him to be so kind as to investigate the report and, if possible, to obtain and to send to the Geological Survey such meteorite specimens as he was able to collect. He was reminded of the orders of the Government of India contained in a circular letter issued in 1925 through the agency of the Geological Survey of India, that all meteorites falling within the confines of British India are the property of the Government of India and should invariably find a resting place in the Geological Section of the Indian Museum, Calcutta.

Mr. E. W. Holland, I.C.S., District Magistrate of Tippera, was successful in obtaining and sending to the Geological Survey of India the eleven specimens of meteorites which you now see exhibited at this meeting. It would appear, however, from the reports forwarded by Mr. Holland, that possibly other meteorites that fell in the Kachua police area, have been collected and kept awaiting instructions to send them to the Indian Museum. All those exhibited to-night were collected from the Chandina police area. It is to be hoped, therefore, that Mr. Holland will be successful in obtaining other specimens.

The total weight of stones recovered from the Chandina police area is almost 22 kg.; the largest stone weighs a little less than 6,700 grams. This total weight is large compared with that of other falls and ranks third of all falls of meteorites recovered in India and in the possession of

the Geological Survey of India. The largest fall is the Merua meteorite totalling almost 71½ kg. for five pieces; next is the Kuttippuram meteorite of almost 38½ kg. The Karkh fall, described by your President, is just exceeded by the Perpeti fall, being a little over 21,700 grams.

The usual light and sound phenomena accompanied the fall. The reports received mention a sound like 'three bombs' and all agree in stating that there was a bright light in the south-west. The direction of movement of the shower appears to have been from the south-west to north-east. The Perpeti shower revives memories of the very interesting Dokachi meteoric shower of 1903 described by your President. In the Perpeti case, however, it is not possible to state with certainty that the largest stones were carried furthest in the direction of the flight of the shower on account of their greater mass and consequent greater momentum. This was very well shown in the Dokachi fall.

One may refer conveniently here to the usual question, did we have one stone entering the earth's atmosphere which was disrupted almost immediately into the constituent stones of the Perpeti meteoric shower of which the specimens in front of you are examples? Or did the constituent stones of the shower enter the earth's atmosphere as separate individuals? There seems little doubt that if, as is most possible, there was one parent stone, then that stone was disrupted almost immediately it entered the earth's atmosphere in its rarefied outer regions. The stones all have thin crusts of apparently the same thickness. There appears to be a total absence of secondary crusts which are derived when the stones are disrupted at a late stage in their passage through the atmosphere and the heat generated by the resistance of the earth's atmosphere to their passage through it at a reduced speed compared with their original planetary velocity, has been insufficient to fuse the fresh surfaces regularly and to the extent of the crust on the older surface.

Another interesting point with regard to the stones of the Perpeti shower is the total absence of anything suggesting what are termed flow lines, the corrugations on the crust formed by air currents met by the stones in their passage through the atmosphere. The shapes of two at least of the stones are worthy of attention, one being similar to a truncated spheroid and the other rather tetrahedral in form. One can easily imagine these stones travelling through the atmosphere with their rounded and apical ends, respectively, pointed generally in the direction of flight.

The eleven specimens represent ten individuals more or less completely covered with crust, the two smallest stones obviously having been broken apart by human agency after their recovery. The largest stone appears to have lost quite an appreciable quantity of its mass through the same agency.

Meteorites are classified generally into two main divisions, stones and irons. The Perpeti meteorite falls into the stone class and is composed mainly of silicate minerals with subordinate metallic minerals. It is a rather friable, white stone on a fresh fracture, containing few chondri. The structure is very well illustrated in the thin sections of the smallest of the stones which may be examined through the microscope here by means of transmitted light. Chondri are those peculiar rounded grains or spherules which have no exact counterparts in igneous rocks.

The chief metallic minerals present are nickel-iron, probably in its various alloys kamacite, taenite and plessite, steel-grey by reflected light; troilite, the sulphide of iron, bronze by the same light, which is regarded as being practically the equivalent of pyrrhotite; and magnetite, very black and not so abundant as the troilite and nickel-iron. The chief silicate minerals are olivine, the most abundant; enstatite and clinoenstatite, approximately equal in distribution; and a little plagioclase feldspar. A certain amount of what is probably apatite, the phosphate and fluoride or chloride of lime, also occurs.

The meteorite has been classified as a White Chondrite, Cw, according to Brezina's classification. It will be described by me in a paper to be

published in the *Records* of the Geological Survey of India, in which Mr. P. C. Roy's analysis will be included. It will afterwards be exhibited in the meteorite collections of the Geological Survey of India in the Indian Museum which, it may interest you to learn, rank among the best in the world, being inferior in numbers and material probably only to the British Museum in South Kensington and the Field Museum of Chicago.

The President said that it was always pleasant to welcome visitors from outer space and, therefore, we were grateful to Dr. Coulson for his exhibit of the eleven stones that fell during a recent meteoric shower at Perpeti and adjoining villages. The President had himself many years ago taken an interest in a similar shower of stones in Eastern Bengal, described as the Dokachi meteorite, to which Dr. Coulson has referred. The chief interest of the Dokachi fall was the fact that the stones of greater mass had travelled further along their path than those of smaller mass due, of course, to their greater ability to overcome resistance of the air. This indicated that these fragments were all portions of one meteorite that had broken up after its entry into earth's atmosphere.

Dr. Coulson had fully investigated the same point with reference to the Perpeti meteorite, and although the evidence was not so clear, yet there were indications of a similar distribution, making it probable that this shower of meteorites also had resulted from the break up of a single meteorite.

Mr. W. D. West asked if more than one light was seen?

Dr. Coulson replied that only one light was seen in a south-westerly direction. This would seem to be an additional proof that only one parent meteorite entered the earth's atmosphere and that this was disrupted with emission of heat and light almost immediately into the stones now exhibited. In the cases of other showers, however, more than one light has been recorded.

Mr. H. Hobbs asked what was the size of the largest meteorite known?

Dr. Coulson replied that the largest single specimen preserved in any museum is the 'Ahnighito' iron meteorite from Cape York, Greenland, which was transported by Admiral R. E. Peary to the American Museum of Natural History in New York. Its weight is 33 metric tons. The largest meteorite known is the Hoba iron meteorite of South-West Africa, weighing 60 metric tons, which is still *in situ*. Borings have failed to prove the existence of any large mass in the very large meteor crater near Cañon Diablo in Arizona.

Sir U. N. Brahmachari enquired if the elements in meteorites are the same as those of the earth?

Dr. Coulson replied that the elements are the same, but there is a larger proportion of iron and nickel than in the rocks of the earth's crust. The earth's interior, however, is denser than its exterior and its composition is more akin to that of iron meteorites.

## 2. A. M. HERON.—*An artificial 'natural' Freak from China.*

In a previous meeting of the Society Mr. Van Manen exhibited three large ferruginous concretions, composed of limonite and hæmatite, which had been acquired by him from a Chinese monk. These specimens were said to have come from some unspecified locality in China. Limonite is a common ore of iron, and is formed in meadows and marshes. It seemed likely that these specimens had been formed by the accretion of limonite around some substance which might since have disintegrated or been artificially removed, leaving the hollow shell of limonite.

The interest of the specimens lay in their unusual size, and their hollow core.

The Chinese love such freaks of nature and look upon them as objects of art. In olden times natural freaks had to be reported to the Emperor, and in Chinese literature there are frequent notices concerning such objects.

By mischance one of the three concretions recently fell down and broke into a number of small fragments. Advantage was taken of the circumstance to examine the structure of the material more closely than could be done on the unbroken samples.

Drs. Fox and Coulson and Mr. Gee have examined with me the fragments of this curious object. It appears to be composed of lime, calcium hydrate, with a certain amount of carbonate such as always develops in lime mortar after setting and exposure to the air for some months. It must therefore be artificial, and this is confirmed by the fact that it consists of two or more uneven layers of lime,  $\frac{1}{8}$  to  $\frac{1}{4}$  inch in thickness which are separated by a thin film of fibrous material suggestive of the remains of Chinese paper.

In the middle of one of the layers is a small fragment of carbon with a shining conchoidal fracture, like cannel coal.

It would seem that a layer of liquid lime mortar had been poured over a crude baton-shaped mould, thin paper had been laid on it, and one or more layers again poured on and allowed to set with a rough knobby surface, no attempt having been made to smooth or finish it off neatly. This intentional lack of finish is difficult to reconcile with the habitual care of the Chinese artificer.

The outer surface has been heavily but unequally impregnated with limonite, hydrated oxide of iron, to a depth of  $\frac{1}{4}$  inch in places, in others a mere film, and this has also spread along the surface of the junction between the outer layer and the one below it. The iron oxide may in part have replaced the lime and part of it has dehydrated to micaceous hæmatite.

Dr. Fox suggests that it may be a filter to purify chalybeate water, the iron removed impregnating and replacing the lime, and also points out that it would soften water in the general manner that Clarke's process does with lime water. There the water is brought to the lime and not the lime water to the hard water as in Clarke's process. It is hoped that some light may be thrown on this puzzling object by exhibiting it to the Society.

Dr. Heron explained the exhibit in terms substantially covered by the paragraph contained in the meeting programme.

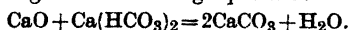
The President recalled that the specimens discussed by Dr. Heron had been exhibited at a previous meeting on the assumption that they were products of nature, and their similarity thereto was so great that they have been accepted as ferruginous concretions by several geologists who had examined the specimens. The accident, therefore in Mr. Van

Manen's household, which had led to one of these specimens being broken, must be regarded as a fortunate one. The purpose of bringing this matter again before the Society was in order to elicit opinion from members concerning the origin of these curious bodies which, it appeared from Dr. Heron's account, must certainly be regarded as of artificial origin. If they had been made deliberately then they were another testimonial to the extraordinary skill of the Chinese in that they had succeeded in producing objects which have been accepted by geologists as natural products.

Dr. E. Spencer remarked :—

With regard to Dr. Fox's suggestion that these hollow concretions may have been used as primitive water softeners, I do not think that this is probable for the following reasons.

The use of lime (CaO) removing temporary hardness from water has to be very carefully regulated. The soluble calcium bicarbonate  $\text{Ca}(\text{HCO}_3)_2$ , which constitutes the temporary hardness of water, may be reduced to insoluble carbonate  $\text{CaCO}_3$  by the addition of one equivalent of lime (CaO) according to the following equation :—



The result is that two equivalents of calcium carbonate are thrown out of solution leaving the water free from temporary hardness.

If, however, an excess of lime CaO is added it goes into solution as alkaline lime hardness which is just as objectionable as the original temporary hardness.

A filter apparatus using a lime container as a filter medium would not be able to control the amount of lime added, and the filtered water would thus be liable to contain at least as much hardness due to excess free lime, as the original temporary bicarbonate hardness.

My view is that if these concretions consist essentially of lime, as stated by Dr. Heron the article has probably been produced accidentally as a bye-product of some manufacturing process, the lime having deposited round a hollow surface.

Before any further pronouncement can be made on the subject it will be necessary to make a detailed chemical analysis of the substance.

[In a subsequent written communication Dr. Spencer added] :—

Since the discussion at the meeting a fragment of the broken 'concretion' handed to me by Dr. Heron has been analysed in Messrs. Bird & Co.'s Research Laboratory with the following interesting results :—

Insolubles	..	..	0.30%
Soluble Silica	..	..	16.61%
Alumina	..	..	5.25%
Ferric Oxide	..	..	2.00%
Lime	..	..	46.90%
Magnesia	..	..	0.95%
Sulphuric Anhydride	..	..	1.15%
Carbon Dioxide	..	..	7.00%
Water, etc.	..	..	18.25%
TOTAL			98.41%

This analysis shows that the concretion has been made from ordinary commercial cement which has been mixed with water and allowed to set in the ordinary way. This fact definitely rules out the possibility of an accidental origin. The article has either been made deliberately as a natural concretion, or it may have represented a primitive form of water container, or may perhaps have constituted the interior lining of a metal or some other container. The small black particles occluded in the cement, to which Dr. Heron drew my attention, have been found on chemical examination to consist of ordinary bituminous coal.

Mr. Van Manen said that he regarded Dr. Spencer's suggestion, that the objects might be accidental bye-products of some manufacturing process, a most valuable one. He recalled that amongst the Tibetans and Chinese freaks of nature were much appreciated and admired on the principle of *omne ignotum pro magnifico*. As amongst these people knowledge of natural history was often very scanty, they could often not distinguish between bizarre natural and artificial forms. The Tibetans styled natural freaks *rang hbyung*, that is: self-originated or naturally produced. He had been offered many pieces of stone, crystals, horns or bones of animals, pieces of decayed wood, and similar objects, which, simply on account of their unusual shape, were thought much of by their possessors. A Tibetan once suggested to him that an ordinary glass paper-weight ball with vivid flower- or flame-shaped colours cast inside would be counted as a most valuable rarity in Tibet, under the impression that it was a natural freak. He thought that Dr. Spencer's suggestion was plausible for this reason that it is not likely that the artificial objects had been purposely manufactured as artificial freaks. If that had been the case, such manufacture would certainly not be an isolated instance, and other specimens would be floating about. In this case, neither his Chinese, nor his Tibetan friends, nor any European collector had met similar objects; so they could not be very common. It might be very well that some observant Chinaman or Tibetan had picked up the things from a rubbish heap near some mine or iron or cement works as marvels of nature.

### 3. JOHAN VAN MANEN.—*A Babylonian clay Tablet with cuneiform Inscriptions.*

Mr. Van Manen said that his communication was not intended to give information but to seek it. India had, like other countries, its special advantages in the matter of material for scholarly study. In all Indological matters its collections and resources were rich. In some other directions its material and resources were poor; for instance with reference to Egyptological or Babylonian studies, experts and reference works.

Recently his assistance had been sought to determine the contents of an inscription on a small clay tablet presumably brought from Mesopotamia. The owner possesses half a dozen similar ones but can give no precise information concerning their provenance. They are probably war relics. The little brick was now placed before the meeting in the hope that some one amongst those present might either be able to give information concerning it, or help in putting the Society in touch with some local scholar able to do so. If no solution could be arrived at in the meeting, perhaps publication of the request in the Advance Proceedings might lead to it.

The tablet was handed round.

### 4. W. D. WEST.—*Cinematograph film of Quetta after the earthquake.*

A short film showing the destruction wrought by the earthquake in various parts of Quetta and at Mastung. Of particular interest are new earthquake-proof bungalows built by the N.W. Ry. since the last earthquake, and quite undamaged by the present earthquake.

It was decided to hold over this exhibit till the next Ordinary Monthly Meeting to be held on MONDAY, THE 2ND SEPTEMBER.



## SEPTEMBER, 1935.

An Ordinary Monthly Meeting of the Asiatic Society of Bengal was held on Monday, the 2nd, at 5-30 P.M.

## PRESENT.

SIR LEWIS FERMOR, KT., O.B.E., D.Sc. (Lond.), A.R.S.M., M.INST.M.M., F.G.S., F.R.S., F.A.S.B., President, in the Chair.

*Members :*

Auden, Mr. J. B.	Ghosh, Mr. P. N.
Biswas, Mr. K.	Groth, Mr. E. M.
Bogdanov, Mr. L.	Heron, Dr. A. M.
Brahmachari, Dr. P. N.	Hora, Dr. S. L.
Brown, Mr. Percy	Hosain, Dr. M. H.
Chakravarti, Prof. C.	Lal, Dr. R. B.
Chatterji, Mr. P. P.	Manen, Mr. Johan van
Coulson, Dr. A. L.	Mitter, Hon'ble Sir B. L.
Ezra, Sir David	Olpadvala, Mr. E. S.
Fox, Dr. C. S.	Prashad, Dr. B.
Gee, Mr. E. R.	Sondhi, Mr. V. P.
Ghose, Mr. T. P.	Spencer, Dr. E.
	West, Mr. W. D.

*Visitors :*

Bagchi, Mr. D.	Fermor, Lady
Bhattacharji, Mr. D.	Fox, Mrs.
Ezra, Lady	Hunt, Mr. H. C.
	Mitter, Lady

The minutes of the last meeting were read and confirmed.

The General Secretary reported receipt of eight presentations of books, etc., which had been placed on the table for inspection.

The following candidates were balloted for for election as Ordinary Members :—

(18) *Chakrabarti, Sukumar*, B.Sc. and B.A. (Calcutta), D.Litt. (Paris), Barrister-at-Law, Member of the Société Asiatique de Paris, P. 139, Russa Road, Calcutta.

Proposer : Johan van Manen.

Seconder : Sir Lewis Fermor.

(19) *Faruqi, A. J.*, M.Sc. (Alld.), Ph.D. (London), D.I.C., Lecturer, Zoology Department, Muslim University, Aligarh, U.P.

Proposer : S. L. Hora.

Seconder : M. Hidayat Hosain.

(20) *Howland, Felix*, Professor of English, Habibia College, Kabul, Afghanistan.

Proposer : Jamal-ud-Din Ahmad.

Seconder : W. D. West.

The General Secretary reported that there had been no loss of membership, since the previous meeting, by death.



The General Secretary reported that there had been no loss of membership, since the previous meeting, by resignation.

The General Secretary reported that there had been no lapses of election, since the previous meeting, under Rule 9.

The General Secretary reported that there had been no withdrawals of application, since the previous meeting.

Papers were presented, and Exhibits were shown and commented upon, as detailed below.

The Chairman announced the result of the ballot for the election of Ordinary Members and declared all candidates duly elected.

The Chairman announced that no meeting of the Medical Section had as yet been arranged to be held during the current month.

The Chairman announced that unless special notice was given there would not be any Monthly Meeting during the recess month of October, 1935.

The following paper was presented :—

1. JATINDRA MOHAN DATTA.—*A new type of Bagh-Bandi or Tiger-play prevalent at Basirhat in Lower Bengal.*

A short note describing a variant of a previously published type of sedentary game, *Bagh-Bandi*, a hybrid between *Mughal-Pathān* and *Bagh-Bandi*. Locality, Basirhat, District of 24-Parganas. Dying out.

In the absence of the author the paper was taken as read.

The following exhibits were shown and commented upon :—

1. SIR L. L. FERMOR.—*Tubular Panjal Trap from Kashmir.*

In Kashmir there occurs a thick succession of basic volcanic rocks known as the Panjal traps which have been studied by a succession of geologists, namely Lydekker, McMahon, Middlemiss, Bion, and Wadia. These rocks are generally regarded as surface lava flows probably of terrestrial origin, but possibly submarine. They are of basic—basaltic—composition, though one observer (Wadia) has, by using the term 'augite-andesite', suggested a tendency to an intermediate composition.

These lavas are several thousand feet thick and in age range from Upper Carboniferous to Middle Trias.

Although holding the view that these rocks are true surface lavas of the age indicated by their position, Middlemiss, in his usual philosophical manner, has discussed the possibility that they might be intrusive and even of Deccan trap age, this possibility being suggested by the wide range in age of the rocks with which these traps are associated.

No geologist has yet given any careful description of the macroscopic features of these lavas putting beyond question their almost certain surface origin.

Last autumn I visited Kashmir, and under Mr. Wadia's guidance was shown some of the most important features of Kashmir geology. One of our excursions was to Shukar-ud-din hill near Botiung village on west side of Wular lake. Here Mr. Wadia showed me a fine section of the Panjal traps exposed in a canal cutting. The sheets of lava are dipping to the E.N.E. at about  $45^{\circ}$ , and consequently in a small distance several successive sheets are crossed making it easy to study the nature of the junctions between these sheets. In thickness the flows in this section vary from, say, 6 feet to between 50 and 100 feet. The upper portion of each flow is vesicular and amygdular and a small thickness at the base is usually amygdular, whilst the interiors of the flows are on the whole non-vesicular, though there are often scattered vesicles and sometimes lines thereof.

The most interesting discovery, however, was that in no less than three of the flows there are tubular vesicles at the base such as I have found at the base of some of the Deccan trap flows of Bhusawal in Berar. These are shown in the photograph to be circulated. This photograph shows the vesicular surface of one flow overlain abruptly by another flow, which is compact, except at the base where tubular vesicles can be seen arranged at right angles to the contact of the two flows. The contact is dipping steeply from left to right and is marked by a geological hammer. Under the microscope the tubular rock is found to be a typical basalt rich in what were once olivine crystals now completely altered to iddingsite and serpentine. Although these Panjal traps must originally have been very similar to the Deccan traps in their mineral composition, yet on account of their greater age and disturbance they have been altered with formation of epidote and chloritic and other secondary minerals. There has also been a certain amount of relative movement between successive flows as shown by the fact that the surface of the underlying flow is epidotic and slickensided. Specimens of both the pipe-rock with its tubular vesicles and of the slickensided surface of a flow are shown therewith.

As previously described, the Panjal traps do not contain olivine. These Botiung rocks are interesting also because some of them carry olivine. It may be remembered that in the Bhusawal flows I found evidence that in many flows olivine crystals had sunk towards the base, and as this tubular specimen containing olivine is also a basal specimen, its richness in this mineral may be due to the same cause. I may mention, however, that a specimen from the interior of one of these flows, which has a coarser grain and is, therefore, a dolerite, also contains olivine, though in smaller quantity.

My previous experience of the details of the Deccan trap basalt and dolerite flows pierced by the Bhusawal boring made me realize at once that here was definite evidence of the effusive

surface origin of at least the Panjal traps of this locality; and Mr. Wadia impressed upon me at the time that this discovery was also of importance because, although it was generally accepted that the Panjal traps were surface lavas, yet the possibility of their intrusive origin had been at times discussed.

Dr. C. S. Fox said: It is a great step forward in the geology of the Panjal trap to have such definite evidence that in the section described the trap occurs as undoubted lava flows. The fact that no less than three lava sheets occur successively is, with the evidence of the tubular basal vesicular structure and upper amygdaloidal development, convincing data. If a single lava sheet were present some doubt might perhaps exist as to whether it was a sill or a flow. Many sills show cavities under their upper surfaces. Sir Lewis Fermor has written of these Panjal traps as surface flows. From evidence in the Deccan, Abyssinia, and America there seems to be no doubt that in these cases *surface* also means *sub-aerial*. In each of these cases any sediments associated with the lavas are of fresh-water origin—possibly deposited in small lakes over which the lava spread. In Kashmir the lavas are closely associated with marine strata, and it becomes an important point whether the Pir Panjal lavas were poured out on the land or in the sea. Mr. Wadia had concluded that the Agglomeratic slate was largely composed of volcanic debris, but I do not think he has explained whether this material settled in the sea at the time of its ejection. These Agglomeratic slates are closely related to the Panjal traps, and so it is an important point if it can be definitely stated whether these eruptions were submarine or not. So far as I know we have no detailed descriptions of the character—texture and structure—of submarine lava flows at all comparable with those of the Pir Panjal.

Sir Lewis Fermor replied that Dr. Fox had answered the first question for him, namely that the traps at this exposure were lava flows. He added that a pillow structure was regarded as an indication that lavas had been erupted under submarine conditions. He had not observed any signs of such structures in the section described, nor were there any intercalations of marine or other sediments. The evidence is therefore in favour of a terrestrial origin, as with the Deccan lavas.

Mr. W. D. West asked Sir Lewis Fermor if he had seen the exposures described by C. S. Middlemiss and H. S. Bion, which suggested that the Panjal trap may have been in part intrusive.

If the Panjal trap is composed of lava flows, then the period over which they were erupted must have been of great length, from the Upper Carboniferous to the Middle Trias, one of the longest periods of igneous activity known. This was one of the reasons that prompted Mr. Middlemiss to suggest an intrusive origin.

Mr. West also drew attention to the fact that the area over which the Panjal trap was erupted was probably much greater than generally realized. The Mandi trap, first described by Col. McMahon, was very similar to the Panjal trap, and similar rocks are also found even further south-east.

Dr. A. L. Coulson said: I believe that Sir Henry Hayden has described rocks in Tibet very similar to the Panjal trap, which would also show how widespread these volcanic rocks were.

Sir Lewis Fermor replied that he had limited himself to a description of the Panjal trap at the place mentioned by him and that as he had not personally examined the outcrops described by Mr. Middlemiss and Sir Henry Hayden he did not feel competent to pass an opinion on the questions raised by both previous speakers.

Mr. J. B. Auden also spoke.

Mr. D. S. Bhattacharji said: In the Central Provinces (around Bhandara) it is found that pseudo-vesicular lava like rocks (altered) are formed by complex 'elastic' or 'plastic' deformation of one very basic and another acid or intermediate rock, e.g., a suitable combination of greenstone quartz-rock, epidosite and granite. The 'vesicles' are filled by quartz, epidote and calcite and quartz, dark crushed rock (very basic and comparable with the green-stone of the Panjal trap), etc. These vesicles sometimes form lenticular masses like tubes of the Panjal trap. These are very old rocks and are older than the Deccan trap.

The Panjal traps are very old rocks and do not show any definite sign of their igneous origin. These are also highly disturbed.

It is therefore possible that the vesicular structure is not original but is only a secondary structure developed by earth movement for a long time. If this is true, the question of extrusion or intrusion does not arise at all.

Sir Lewis Fermor in reply wrote that he had no doubt that the rocks of Botiung were igneous rocks judging from both their macroscopic and their microscopic characters. He was not acquainted with Mr. Bhattacharjee's pseudo-vesicular rocks and therefore was not aware how closely they simulated vesicular lavas.

## 2. A. L. COULSON.—*Additional Stones from the Perpeti Meteoric Shower.*

Since the August meeting of the Society, when eleven stones which fell in villages under the jurisdiction of Chandina police station during the Perpeti meteoric shower of the 14th May, 1935, were exhibited, three additional stones, of a total weight of 1,531.604 grams, have been recovered by the District Magistrate from villages under the jurisdiction of Kachua police station in Tippera district. The total weight of all specimens recovered from this shower now amounts to 23,474.18 grams.

One of the three additional stones (298 L) is extremely interesting in being the sole specimen of the shower which shows a secondary crust. This has been developed on two of its faces by their imperfect fusion after their formation as a result of a secondary disruption of the stone in its passage through the earth's atmosphere. The contrast between the generally smooth, thin crust characteristic of all the stones of the Perpeti shower and the coarse, dark, rough, secondary crust on these faces of 298 L is very marked.

The smallest of the three additional stones is an almost perfect crust-covered specimen.

It would appear that the stones of the Perpeti meteoric shower fell within a rectangular area some five miles long by three miles wide, the supposed direction of flight of the parent meteor being in the direction (south-west to north-east) of the shorter side.

Dr. A. L. Coulson said that this evening there seemed to be rather a surfeit of geological exhibitors, with exhibits ranging from tubular vesicles, meteorites, coffins and skulls to earthquakes. He therefore did not propose to take up too much of the time of the meeting.

Dr. Coulson recalled to the members present that at the August meeting of the Society, he had exhibited eleven stones of the meteoric shower that fell at Perpeti in the Tippera district on May 14th, 1935.

Apart from certain characteristics of form, none of those stones had any special interest. It was therefore all the more gratifying to note that of the three extra stones of that shower which had been received since the last meeting, two had features of more than common interest.

The largest stone shows very plainly a secondary crust which has been developed on two of its faces. This secondary crust, as you see, is black, rough to touch, and shows up well in contrast with the smooth, generally thin dark crust on the other parts of the stone. It indicates that this stone, which was born of the parent meteorite when that disrupted into the numerous stones of the Perpeti shower, has itself suffered disruption not very long before it reached the earth's surface. Consequently the time of flight was insufficient for there to be complete fusion of the new surfaces of the stone and only the rough, secondary crust has been formed.

The smallest stone is also very interesting. If one examines closely this surface of the stone, one can see an imperfectly developed system of radiating flow lines. These are due to the effects of surface air currents upon the fused surface of the stone during its flight towards the earth in the atmosphere.

These three additional stones from the Kachua police subdivision, together with the eleven stones previously exhibited from the Chandina police subdivision, both in the Tippera district, form a very valuable addition to the collections of the Geological Survey of India. All of them fell within a rectangular area some five miles by three miles, the shorter side of which is in the direction, north-east to south-west, of the flight of the parent meteorite. This is unusual as one expects the longer side to be in the direction of flight of the parent stone, as in the case of the Dokachi meteoric shower referred to at the last meeting. However the cause may be due to the fact that apart from the two largest stones, weighing about 7 and 5 kg. respectively, all the other stones are less than 2.7 kg. and no fewer than seven of these are more than half a kilogram.

Dr. Coulson added that before concluding his remarks, he would like to draw attention to the report that appeared in to-day's (2nd September) *Statesman*, in which it was stated that the stones of a recent meteoric fall near Comilla, totalling some 52 lbs., had been collected by the District Magistrate of Tippera district and were being sent to the Geological Survey of India. Dr. Coulson stated that if this report were true, then the stones in question were apparently those of the fall on 1st August, 1935, near the village Nangalkot, some 20 miles south of Comilla in the Tippera district of Bengal. The first report concerning this fall appeared in the *Ananda Bazar Patrika*, and a copy, after translation by Mr. P. C. Roy, Assistant Curator, Geological Survey of India, who first drew the attention of the Geological Survey of India to it, was sent to the District Magistrate of Tippera. Recently a communication had been received from the District Magistrate to the effect that enquiries were being made and that a further report would be sent by him later. It was to be hoped from the *Statesman* report that the District Magistrate had been successful in obtaining the stones of this Nangalkot fall and that at the next meeting of the Asiatic Society, the members would be able to see them. There was no connection between the Perpeti meteoric shower and this reported fall at Nangalkot; it was sheerest coincidence that two falls so close together, May and August, should happen to be in the same district of Bengal.

Sir B. L. Mitter asked if there were any statutory orders regarding the possession of meteorites.

Dr. Coulson replied that he was unaware of any orders other than those of the Government of India contained in their circular letter referred to at the last meeting, whereby all meteorites falling within the limits of British India were the property of the Government of India and should normally find a resting place in the collections of the Geological Survey of India in the Indian Museum, Calcutta.

Mr. Percy Brown asked if there was any evidence to the effect that falls of meteorites were becoming more frequent in recent years.

Dr. Coulson replied that he did not think that meteorite falls were becoming more frequent in recent years but, as Mr. Percy Brown suggested, falls are nowadays, through the medium of the Press, being brought more frequently to the notice of the public. Also the Government of India orders referred to are becoming more generally known through constant enquiries being made by the Geological Survey of India on the occasion of any new reported fall.

Mr. Van Manen described the very interesting occurrence of shooting stars being seen by him when he was ill in bed and happened to have his head in the same position on his pillow thus being able to see through the same section of his window on two successive nights recently. According to his impression—he had not noted the hour—at approximately the same time of the night, at the same place, and in exactly the same direction, a meteor or shooting star appeared, and became extinguished halfway in the field of vision, at the same approximate distance from the window frame. The luminous track was rather dull than brilliant white. He asked whether these would more likely have been meteors or shooting stars.

Dr. Coulson replied that most meteorites have been recorded as falling within the months of May and June. These are the summer months in the northern hemisphere where most observers are domiciled, but against that must be remembered the fact that very few meteorites are known to fall in July, which is also a summer month. According to Pickering, falling stars and fireballs are much more evenly distributed through the year than are meteorites and their period of greatest number is from July to November. In May and June, in contrast with meteorites, their number is at a minimum. So there is every reason to question the gradation that has been supposed to exist between meteors and meteorites.

3. V. P. SONDLI.—*A Coffin and a Skull from a limestone Cave in the Southern Shan States, Burma.*

In the course of a geological traverse in a remote part of the Southern Shan States, Burma, in 1932, while making the usual enquiries on the mineral occurrences in the place, the exhibitor was informed of the existence of a cave there, containing coffins with human skeletons. It was only recently discovered by a honey-collector who had climbed to the mouth of the cave to collect honey from a beehive there, by means of bamboos vertically fixed in the crevices.

The story appeared incredible at the time as not only is no present tribe known to dispose of their dead in this manner, but the transport of heavy coffins to the cave, which is situated in the middle of a sheer cliff some 500 ft. in height, seemed impossible. But the old honey-collector insisted that he had seen the coffins and in support produced a skull that he had grabbed from the nearest coffin. The exhibitor thereupon decided to visit the cave himself and did so twice, in 1933 and 1935, and he has brought back a coffin and a skull. Extensive enquiries in the Shan States failed to elicit any information as to what tribe this burial place could belong to, and the object of the present exhibit is to try the medium of the Asiatic Society of Bengal for this purpose.

Mr. Sondhi said :—

In the course of my geological work in the Southern Shan States, Burma, in 1932, I visited an old silver mine near Melun (Melawn) in the Mawknai State, and while I was making enquiries on the history of the mine and on other mineral occurrences in the area, I was informed of a recent discovery of a cave in the neighbourhood, filled with wooden coffins containing human skeletons. The cave lies in a very inaccessible place, in the centre of a sheer cliff, some 500 feet high, and was discovered quite accidentally by an old inhabitant of Melun, who managed to climb up to it to collect honey from some beehives he had noticed from a distance. While doing so he happened to peep into the cave and was astonished to find it full of coffins with skeletons. He brought down a few bones and an earthen pot that he found near the entrance. The bones were much valued as charms and amulets to ward off evil spirits and were distributed to the villagers, the old honey-collector retaining a complete cranium and the earthen pot for himself. After some persuasion and monetary compensation I took possession of these and brought them down to Rangoon. The pot was made crudely out of poor clay and was only lightly baked, and its shape and size were quite new to the villagers. It reached Rangoon safely but in a few days it fell to small pieces due to excessive humidity. The skull was shown to Col. Lack, I.M.S., then Principal, Medical School, Rangoon, who thought it belonged to a modern man.

While discussing with the villagers as to what tribe these coffins and skeletons could possibly belong to, I was told of a strong and widespread belief that there existed in the jungles in the neighbourhood, a primitive type of human beings who roam about like other denizens of the forest. They were described as hairy men about the size of an average Shan but none of the villagers present had actually seen one, although one or two asserted that they had seen their foot-prints and had heard their voices from a distance. I was also informed that human bones were sometimes found in places where their presence is not accounted for, and rarely an earthen pot or a wooden implement is picked up, of a type unknown to the villagers ; but none of these things could be produced for my inspection because such things, I was told, were not preserved, they being of no good to anybody. These primitive men keep well out of sight of the civilized men and away from their habitations. But sometimes when the paddy is ripe they are reported to have approached the villages and fields at night and decamped with paddy. They are also reported to chop at trees with an upward stroke which is contrary to the common practice. The villagers are usually shy of talking on such matters for fear of being ridiculed but when encouraged and listened to patiently they become communicative. It is curious that whereas an average native of these parts attributes any and all inexplicable occurrences to 'Nat', the Lord of Evil, whom they fear and revere, the supposed primitive human beings are spoken of in a patronizing and light-hearted manner, and their actions are regarded as the misdeeds of a spoilt child.

There seemed to be no way of proving the existence of these primitive people but I decided personally to confirm the truth of the story about the cave and the coffins. On return to Calcutta I discussed the story with Dr. S. L. Hora and he also impressed on me the necessity of a visit to the cave and of recovering a coffin if possible.

An opportunity offered itself in 1933 when, with the help of some villagers, a light bamboo scaffolding was put up. The only practicable way of reaching the cave is first to climb the slope just to the east of the cliff, up to the level of the cave, and then to negotiate the remaining distance of about 30 yards by walking over bamboos fixed in between crevices and ledges. During this trip I was led by the original discoverer. In order to keep both hands free for clutching at any holds that might offer on the rock-face we had to leave behind things like ropes, spades, lanterns, etc. A small camera and some flash-powder

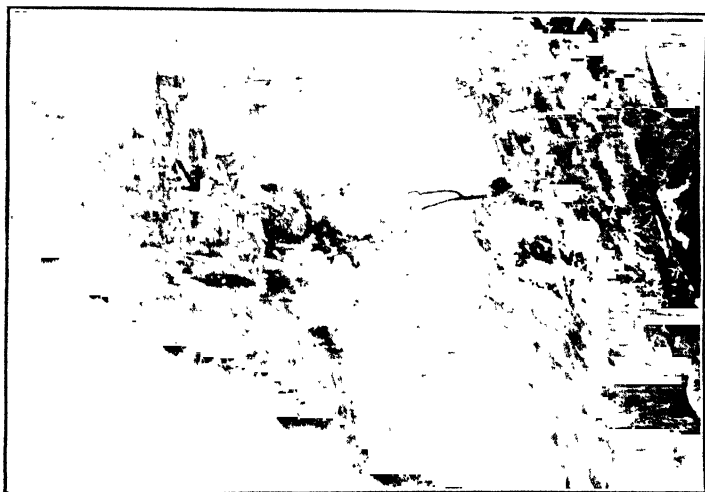


FIG. 1.

FIG. 1. A view of the lime-stone cliff with the arrows pointing to the cave. The dotted line represents the route taken. Below the cave, and slightly to the right is seen the bamboo scaffolding as used in the first visit.

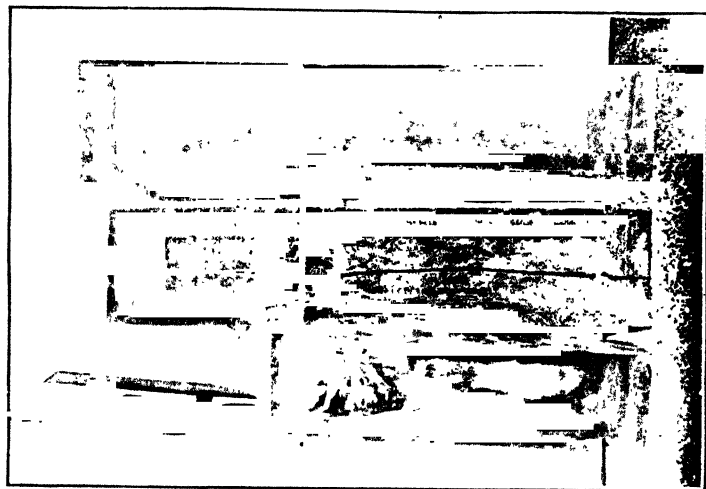


FIG. 2.

FIG. 2. The three coffins brought out of the cave. The one on the right was exhibited in the meeting. The one on the left has an animal figure (inserted above) carved on the reverse side.



were carried in pockets. Boots had to be discarded as they slipped badly on the bamboos, and although the latter were extremely hot in the midday sun, they had to be negotiated barefeet. It was very much like tight-rope walking, only the rope in this case was a hot bamboo! We had constantly to face the rock-wall, lean against it and move sideways. With difficulty we reached the mouth of the cave and crawled in through the crooked entrance.

The cave is in reality a natural fissure in the limestone, with a slanting roof and an uneven floor. The coffins and human bones were there as described by the honey-collector, and it was so full of these that movement inside the cave was difficult. We had hardly crawled some 10 feet when the old guide picked up a freshly shed skin of a large snake! As we were not prepared to meet such an emergency I thought it best to make a hurried retreat before we annoyed the possessor of the skin. Moreover, a glance was enough to show that there was nothing else we could do beyond confirming the discovery. It was impossible to take any photograph in our cramped position; we could not get far enough from the coffins for the purpose and we could not use the flash for fear of choking ourselves with fumes and also for fear of accidentally igniting the coffins, which were tinder-dry. It was also impossible for us to bring down a coffin or even to throw one out, as in that case not only would the coffin be reduced to splinters on landing below the cliff but it would at the same time sweep away our scaffolding from below the mouth of the cave which was our only possible way of retreat. It was clear that for further exploration a better-equipped party was needed.

The discovery was brought to the notice of the Commissioner, Federated Shan States, Mr. J. Clague, I.C.S., who at once took a great interest in it, and it was made known to other officers with a view to collecting whatever information they could.

In March, 1935, we got up a party consisting of Mr. N. W. Kelly, Capt. R. L. Frost, Mrs. Frost, Mr. P. A. Plunkett, three officers of a timber company, and myself. We owe the success of this expedition entirely to the excellent and thorough arrangements made by Mr. Kelly, to whom we are all indebted. A number of villagers was collected and a strong bamboo scaffolding was rigged up under his supervision. As there was no room for all of us in the cave we went in in relays. A look inside the cave was enough to show that the cave had been raided since my last visit. There were very few bones left now and practically no skull was obtained. The coffins too were not arranged now in the manner I had seen them last. As we had lights this time we could see further in. There were some 30 to 40 coffins in the portion of the cave visible to us. They varied in size and in some cases, slightly in design. They are all carved out of solid logs of teak and the outer surfaces are levelled by short chopping strokes rather than by a saw, much in the manner that the present day Burmese and Shan dug-out are made. The average dimensions are somewhat less than those required to accommodate an average man, and it is presumed that the corpses must have been in a shrunken state to fit these coffins. One of the three coffins brought down has the figure of a four-legged animal (lizard?) carved out of the same log as the coffin, and there are traces of another similar figure facing it. Presumably this formed a lid to a coffin. From the growth rings exposed on the ends of the coffin we find that it was carved out of a quarter of a log of teak and some of the logs must have been from 3 to 4 feet in diameter. Coffins near the floor of the cave were usually rotten but those higher up were mostly in a good state of preservation. It may either indicate a greater age for the coffins nearer the bottom, or it may be due to greater amount of moisture on the floor, which, it is possible, may be partly under water in the rainy season.

A curious feature of the bones collected is that almost all the long bones—those of the legs, are roughly cut or scraped at more or less the same position at the two terminals. The parallel narrow grooves and

lines are like those produced by the gnawing of rodents, but it has been suggested that these cuts might be a *post mortem* mutilation by human agency representing some kind of a burial ritual of a particular tribe. Among the bones collected there are a few slender ones, one of which exhibited here has kindly been identified by Dr. B. Prashad as a femur of a young monkey.

Extensive enquiries in the Shan States have so far failed to elicit any information as to what tribe this burial place could belong to. All the existing tribes bury their dead underground except for Buddhist monks and the members of ruling families who are cremated. Other equally puzzling problems, though of local interest, are: how were the coffins transported to the cave, and how did the bones come to be mutilated? The coffins could not have been lowered from the summit of the cliff to the cave. It is possible that the cave or the fissure, extends further than we could see, to the other side of the hill, and was entered into from that direction. No trace of such an entrance, however, exists. Possibly it existed formerly, and was filled up after the cave was fully loaded with the coffins, and the tropical growth obliterated the site in a few years. The only other conceivable way would be by a rock ledge that may have once extended over the gaps that we had to span with bamboo scaffolding. This could have been broken down after the cave was full, or possibly the ledge fell off itself through natural agencies, such as an earthquake or a land-slide. A narrow ledge does, in fact, extend over part of the way and lends support to this supposition.

The object of the present exhibit is to circulate among the members of the Society the circumstances of the discovery of coffins containing human skeletons in an inaccessible cave in a remote part of Burma, in the hope that some light will be thrown by them on this mysterious occurrence and on the various problems connected with it.

Dr. Bainsi Prashad described the human bones submitted to him for examination. He added that the grooves, or marks, occurring at the end of the bones seemed to him produced by rodents and not by human agency. He added that the femur of a monkey was found free from such markings.

Dr. Hora remarked that in 1933 he enquired from Mr. Sondhi if he had heard any stories of 'wild men' during his extensive travels in Burma. The information was required for Mr. Johan van Manen who was then making a detailed study of the subject. Mr. Sondhi gave him an account of a supposed hairy primitive tribe near the village of Melun in Burma and mentioned the existence of a large number of their peculiar coffins in a cave. At the speaker's suggestion Mr. Sondhi wrote a note about this tribe which was shown to Dr. B. S. Guha, Anthropologist with the Zoological Survey of India. The speaker had also requested Mr. Sondhi to take further interest in the subject and it was a matter of great pleasure to him that so many fresh details had been gathered. On Dr. Guha's return the information now available would be supplied to him and the speaker did not doubt that Dr. Guha would be able to throw some light on these peculiar customs. In the meantime if Mr. Sondhi could get further opportunities to collect more material, he should do his best to avail himself of these and send the material to the Zoological Survey of India for investigation.

Dr. Guha's comments on Mr. Sondhi's note were as follows:—

Mr. Sondhi's note on the existence of a hairy primitive tribe near the village of Melun (Burma) is very interesting and calls for a thorough exploration of the region. Of the existence of a non-mongoloid primitive stratum in the population of the unexplored regions of Burma we have many evidences and remnants of the same racial stock in comparatively unmixed state may very possibly be found in isolated tracts not explored so far. Exposure of dead bodies in canoes is part of a widely spread

custom of the disposal of the dead which links further India with Oceania

I would suggest : (i) photographs and all details regarding this form of the disposal of the dead be taken and if possible locate the tribe which still practices this, (ii) collection of all skulls and if possible other objects, such as earthen pots etcetera, which are left there. If an entire canoe can be procured so much the better. In any case I would strongly urge that all the skulls that can be got hold of should be kept and sent to us in the Indian Museum. The more skulls that can be procured the better for our purpose. If possible attempts should be made to get the mandibles with the skulls. Skulls should be given preference to, no doubt, but other bones, specially the pelvic and the long bones are very useful for study. If ascertainable the bones of each single skeleton should be marked separately so that there is no chance of their getting mixed up.

If living men of the tribe be observable, then photos should be taken of them as well as of their habitations, and all details regarding their mode of life and customs should be gathered.

Mr. *Van Manen* drew attention to a most remarkable coincidence in connection with this matter. Exactly 40 years ago a similar discovery was made under similar circumstances, though in a place far distant from the Shan State and apparently unrelated to them and their inhabitants. The description of that earlier discovery was published in the *Journal of the Anthropological Institute of Great Britain and Ireland*, Vol. 26, (1897), page 33ff. The full title of that communication ran :—

‘On Unusual Forms of Burial by People of the East Coast of Borneo. By C. V. Creagh, Esq.’

For purposes of comparison it is sufficient to quote the ‘Extract from Diary for March, 1895’ with which the note opens :—

‘March 13th.—Visited some caves in a limestone hill on the left bank of the river near the Batu Puteh estate. These caves were used as burial places by a former race of inhabitants of whom none of the present settlers or traders on the Kinabatangan could give me any information. The entrance to the upper cave (being in the face of an almost perpendicular rock at about seventy or eighty feet from the ground) is somewhat difficult to reach. It contains about 40 bilian (= ironwood) coffins, artistically carved with figures of buffaloes, crocodiles, lizards, and snakes, containing skeletons of men, women, and children ; and also sumpitans, spears, and articles of Chinese and other pottery, with brass ornaments of native and foreign workmanship. The relics appear to me to be of Javanese origin, but there is no tradition on the river of settlers of this nationality. The carvings and scroll work on some of the coffins are superior to those now executed by native workmen.’

The further details are given in a brief note, only two and a half printed pages in length, with illustrations added on another page.

The speaker hoped that in further investigations regarding Mr. Sondhi's discovery, the previous one from Borneo should be kept in mind.

#### 4. W. D. WEST.—*Cinematograph Film of Quetta after the Earthquake.*

A short film showing the destruction wrought by the earthquake in various parts of Quetta and at Mastung. Of particular interest are new earthquake-proof bungalows built by the N.-W. Ry. since the last earthquake, and quite undamaged by the present earthquake.

Mr. *West* said that the film was taken with the object of placing on permanent record the effects of the earthquake in Quetta and the surrounding country, and of showing the relation between the damage sustained by buildings and the nature of their construction. The great

loss of life, the largest that has occurred in any Indian earthquake, was directly attributable to the inferior construction of the buildings.

Some of the features of the earthquake shown in the film included the complete destruction of Quetta city; the gradual decrease in the intensity of the damage towards the Cantonment and the Staff College, which was scarcely affected; the manner in which certain buildings recently constructed by the North-Western Railway on earthquake-proof lines escaped undamaged; the rotation of monuments in the cemetery; the heavy falls of rock on Chiltan mountain; the fissuring of the alluvium between Chiltan and Mastung, and the associated buckling of the railway line; and the general destruction in Mastung.



### NOVEMBER, 1935.

An Ordinary Monthly Meeting of the Asiatic Society of Bengal was held on Monday, the 4th, at 5-30 P.M.

#### PRESENT.

SIR LEWIS FERMOR, K.T., O.B.E., D.Sc., A.R.S.M., F.G.S., M.INST.M.M., F.R.S., F.A.S.B., President, in the Chair.

#### *Members :*

Basu, Mr. N. M.  
Bose, Mr. M. M.  
Brahmachari, Sir U. N.  
Brown, Mr. Percy  
Chatterjee, Mr. P. P.  
Chatterji, Dr. S. K.  
Coulson, Dr. A. L.  
Dey, Mr. Mukul  
Driver, Mr. D. C.  
Ezra, Sir David  
Fawcus, Mr. L. R.  
Ghose, Mr. T. P.

Ghuznavi, Mr. I. S. K.  
Groth, Mr. E. M.  
Heron, Dr. A. M.  
Hobbs, Mr. Harry  
Hora, Dr. S. L.  
Hosain, Dr. M. H.  
Jain, Mr. C. L.  
Majumdar, Mr. N. G.  
Manen, Mr. Johan van  
Mitter, Sir B. L.  
Mukherjee, Dr. J. N.  
Ow-Wachendorf, Baron W.

West, Mr. W. D.

#### *Visitors :*

Blake, Mrs. G. F.  
Brown, Mrs. Percy  
Ezra, Lady

Fermor, Lady  
Hafiz, Dr. H. A.  
Ow-Wachendorf, Baroness

The minutes of the last meeting were read and confirmed.

The General Secretary reported receipt of eleven presentations of books, etc., which had been placed on the table for inspection.

The General Secretary reported that the following candidates had been elected Ordinary Members during the recess month, October, under Rule 7 :—

(21) *Mitter, Sudhir Chunder*, Barrister-at-Law, 19, Camac Street, Calcutta.

Proposer : Sir B. L. Mitter.

Seconder : Sir L. L. Fermor.

(22) *Chaudhuri, Sachindra Nath*, Barrister-at-Law, 52, Ballygunge Circular Road, Calcutta.

Proposer : Sir B. L. Mitter.

Seconder : Sir L. L. Fermor.

(23) *Banerjee, Sailendra Nath*, Barrister-at-Law, 307, Circus Avenue, Calcutta.

Proposer : Sir B. L. Mitter.

Seconder : Sir L. L. Fermor.

(24) *Dutt, Mohendra Nath*, L.E., I.Eng.S. (Retired), Consulting Engineer, Late Executive Engineer, P.W.D., 6, Old Post Office Street, Calcutta; 12, Kailas Bose Lane, Howrah.

Proposer : Sir B. L. Mitter.

Seconder : Sir L. L. Fermor.

(25) *Basu, Satyendra Kumar*, M.Sc., Extra Assistant Conservator of Forests, Clover Cot, Darjeeling.

Proposer : N. K. Basu.

Seconder : Sir U. N. Brahmachari.

The General Secretary announced that the following candidates would be balloted for as Ordinary Members :—

(26) *Bor, N. L.*, M.A., D.Sc., F.L.S., I.F.S., c o. The Conservator of Forests, Shillong, Assam.

Proposer : S. L. Hora.

Seconder : R. N. Chopra.

(27) *Anina Klebe, née Brandt*, Ph.D. (Greifswald, Germany), Psychologist, 14/1, Sudder Street, Calcutta.

Proposer : N. Barwell.

Seconder : Johan van Manen.

(28) *Hirtzel, Michael Arthur Frederick*, B.A. (Trinity College, Oxford), Mercantile Assistant, Macneill & Co., 2, Fairlie Place; 18, Alipore Park Road East, Calcutta.

Proposer : N. Barwell.

Seconder : Johan van Manen.

The General Secretary reported the following loss of membership, since the previous meeting, by death :—

(8) Lt.-Col. H. W. Acton (An Ordinary Member, 1921, Fellow, 1930).

(9) Dr. P. J. Brühl (Life Member, 1909, Fellow, 1912).

(10) Dr. J. N. Maitra (An Ordinary Member, 1918).

(11) Dr. Sylvain Lévi (An Honorary Fellow, 1920).

The General Secretary read an obituary notice of Dr. Sylvain Lévi (see page 219).

The General Secretary reported receipt of news of the death of the following former Members of the Society :—

Sir John Thompson (An Ordinary Member from 1909 to 1933).

Sir D. P. Sarvadhikary (An Ordinary Member from 1909 to 1935 ; Vice-President from 1924 to 1929).

Dr. G. N. Mukhopadhyaya (An Ordinary Member from 1908 to 1931 ; Fellow from 1923 to 1931).

The General Secretary reported the following loss of membership, since the previous meeting, by resignation :—

(19) Otto Hubert (An Ordinary Member, 1926).

The General Secretary reported that there had been no lapses of election, since the previous meeting, under Rule 9.

The General Secretary reported that there had been no withdrawals of application, since the previous meeting.

In accordance with Rule 40, the General Secretary reported that the names of the following Ordinary Members would be removed from the next Member list of the Society :—

- |                    |                    |
|--------------------|--------------------|
| 1. Count Basewitz. | 4. Thornton Jones. |
| 2. R. Friel.       | 5. Hans Koester.   |
| 3. R. Y. Jarvis.   | 6. C. E. Lomax.    |

In accordance with Rule 48(a), the General Secretary reported that the Council, since the last Ordinary Monthly Meeting, had adopted certain modifications in the Regulations regarding the award of the various Memorial Medals awarded by the Society, as follows :—

1. BARCLAY MEMORIAL MEDAL.

Regulation 1 : *Read* 'every two years' for 'each alternate year'.

2. SIR WILLIAM JONES MEMORIAL MEDAL.

Regulation 1 : *Read* 'every three years' for 'biennially'.

3. ALL MEDALS.

Regulation 1 : *Read* 'shall ordinarily be awarded' instead of 'shall be awarded'.

Regulation 3 : *Insert* 'In any year preceding one in which the award will be due' before 'The Council shall'.

Regulation 6 : *Read* as follows :—

(6) The Advisory Board shall submit to the Council the name of the person to whom, in the Board's opinion, the Medal should be awarded. It shall be open to the Board to report to the Council that no award should be made for the year ; and, in such case, provided the Council concurs, a new Advisory Board shall be constituted in the following year, and so on, from year to year, in the manner prescribed above, till recommendation is made for an award and accepted by the Council. The period of years mentioned in Regulation 1 shall always be counted from the year of the Award.

4. PRAMATHA NATH BOSE MEMORIAL MEDAL.

Regulation 3 : Second paragraph, *read* :—

The Council shall then proceed to appoint an Advisory Board which shall include not less than three out of the names placed before the meeting by the General Secretary. The Board shall always include at least two Geological Experts ; and the General Secretary shall be an *ex-officio* member and Secretary of the Board. The Council may, for special reasons, appoint one or more Experts to the Board other than those named by the General Secretary.

Papers were presented, and Exhibits were shown and commented upon, as detailed below.

The Chairman announced the result of the ballot for the election of Ordinary Members and declared all candidates duly elected.

The Chairman announced that a meeting of the Medical Section had been arranged to be held in the Society's Rooms, on Monday, the 18th November, at 6 P.M., when the following papers would be read :—

1. S. L. HORA.—*Recent Indian cases of live fishes impacted in the food and air passages of man.*
2. B. G. MALLAYA.—*Surgical aspect of live fishes impacted in the human food and air passages.*

The following exhibits were shown and commented upon :—

1. PERCY BROWN.—*Portrait of a Lady of the Elizabethan Period.*

Some time ago I acquired in India a miniature painting of a lady, which, according to her costume, shows that she belonged to the Elizabethan period (1533–1603), or shortly after. It is inscribed 'Badshazadi Velayet Angrez', but it is hardly likely to be the portrait of an English Princess, and I suspect this writing was a subsequent addition by an uneducated hand. It seems not improbable that this miniature was painted about the time that the costume it depicts was the vogue in England, say at the beginning of the 17th century.

The questions that arise are two : (1) who is the lady, and (2) who is it by ?

We will take the latter first. That the picture has an English origin there can be little doubt, and the English miniature painters of the early 17th century can be counted on the fingers of one hand. Among these were two of the name of Oliver, father and son, of whom we read that they were responsible for portraits of a larger size than usual, some of them measuring as much as 10 inches by 9 inches. I am presuming the date of this picture was in the vicinity of 1610, in which case the original painter would have been Isaac Oliver, the father, who would have been at his best at that date. Its size also confirms the Oliver attribution.

It is doubtful however whether it is the actual handiwork of an English painter, although this point has not been definitely decided. There is much in the technique, for instance, which it appears could only have been produced by an artist trained in the English tradition : on the other hand there are also certain indications of an oriental style of workmanship in some of the accessories. Both these somewhat conflicting conditions can, however, be more or less harmonized if it is considered that the

picture is a copy by a leading Indian artist of an original by an English artist, such as the elder Oliver.

Now for the question as to the subject of the painting. In the account of 'The Embassy of Sir Thomas Roe', the English Ambassador who spent the years 1615 to 1619 at the Court of the 'Great Mogul', there are several well-known references to the art of miniature painting. On one occasion there was an animated conversation between Roe and the Emperor Jahangir regarding a portrait of a lady in the possession of the former, and which the Emperor much admired. This miniature, it transpired, was one of Lady Roe, and eventually it was lent to Jahangir from which he had five copies made by his own Court painters, after which it was returned to the Ambassador.

In the circumstances it seems not improbable that the present exhibit was one of these copies, and, if so, it has several interests. In the first place it shows the marvellous faculty of Jahangir's artists for imitation, and also their expertness in the miniature painter's art, and its technique. But perhaps equally important it brings before us the portrait of a lady, who, as Lady Roe, appears to have possessed more than the ordinary virtues. For Roe's last will and testament includes the following :—

'Here I take my last leave of her, my most faithful loving and discreet companion in all the troubles and infirmities of my life, beseeching God that we may meet in the joys of heaven; and I desire that my whole will may be interpreted for her best advantage, for I am not otherwise able but with love to requite her merits to me.'

Mr. Brown said :—

The incidents presumed to associate this miniature with Lady Roe will be found on pages 225 and 255 of 'The Embassy of Sir Thomas Roe (Vol. I) by W. Foster, Hakluyt Society'. In this connection it is an inexplicable fact that there is no mention of this embassy in Jahangir's own voluminous memoirs, although Roe was in frequent personal contact with this Mughal Emperor during the course of his mission.

It is fairly clear that the picture is a miniature painting copied by an Indian artist from an English original, as besides the technique there are certain details in the picture which the artist has not quite understood and has accordingly reproduced without adequate knowledge. That the Mughal painter was, however, a genius in his art is shown by the manner in which he has treated the face and hands, particularly the right hand of the lady, which is beautifully rendered. From certain differences in the brush work it is not improbable that this miniature was prepared by two artists, one being a specialist in *chitra-numā* or portraiture, and the other in *surat* or figure drawing. There may also have been a third who provided the background.

Roe's interest in miniature painting is shown by the fact that he included a small selection of these among his effects while on his travels, and the subject was brought up several times by the Emperor Jahangir who was equally interested in this form of painting, during his conversations with the Ambassador. On one occasion Roe showed the emperor



two miniatures one of which impressed Jahangir greatly, and the possession of which it is evident he coveted. Roe managed to retain this work of art by stratagem and by declaring that it was a likeness of 'a friend of myne that was dead'. Jahangir's eulogies of the portrait which Roe relates verbatim contained the remark that 'hee confessed hee neuer sawe so much arte, so much bewty, and Conjured mee to tell him truly whither euer such a woeman liued'.

As a matter of fact the lady was alive and in England, married to Roe just before he left for India, but the fact was kept secret for certain family reasons, hence the ambassador's diplomatic statement that the original of the miniature 'was now dead'. On Roe's return to England all necessity for any concealment had evidently disappeared, and they were never again separated. That Lady Roe was a devoted companion as well as a woman of strong determination is shown by her staunchness to her husband in several subsequent difficult situations while he was doing duty abroad. The miniature here exhibited seems to bear out this latter quality, which is clearly a portrait representing an aristocratic personage of more than ordinary character.

Dr. *Hidayat Hosain* said that the inscription on the miniature read 'Padshazadī vilayat angriz', the English princess, or more literally 'born of the British King'. The handwriting was modern and the inscription may date from long after the date of the picture itself.

Mr. *M. M. Bose* asked three questions as follows :—

1. Is the art of miniature painting an important art in India ?
2. If so, from where and when ?
3. What is the earliest specimen of miniature painting found, up to the present, in India ?

Mr. *Brown* replied :—

With regard to the art of miniature painting in India, it may be said that it was in its early period generally produced on paper, so that its date corresponds approximately with the introduction of paper into this country. The earliest paintings which may be designated 'miniatures', although actually they were illustrations to manuscripts, appear on the western side of India about the 9th or 10th century A.D., and there are other rare specimens of somewhat the same period which have been discovered in Bengal.

As to whether the art was imported, it may be said that the miniature, in its usually accepted form, was brought into being in India during the Mughal period, by artists from Persia, but 'paintings in little', as they were then called, were, as stated above, produced by Indian artists at an early date.

## 2. A. L. COULSON.—*The Patwar Meteorite.*

At the September meeting of the Society, when certain additional stones of the Perpeti meteoric shower were exhibited, mention was made of the reported fall of a meteorite near Nangalkot in the Tippera district of Bengal. As a result of enquiries made by the Geological Survey of India, it has since been ascertained that at about 14.20 hours on the 29th July, 1935, a meteoric shower occurred near the villages of Patwar (23° 9' : 91° 11'), Bhatupara, Gotrasal, Fatehpur, and Majhipara, near Nangalkot, some 20 miles due south of Comilla, the chief town of Tippera district. Patwar is only some 17 miles south-east of Perpeti, also in the Tippera district, which is the locality of the shower referred to above. The two falls, however, are

distinct, but it would be interesting to learn of any other occurrence of two separate meteoric showers within 17 miles of each other after a lapse of two and a half months.

So far three specimens, totalling 35,013.5 grams, which fell at the three first-named villages, have been recovered, the largest (23,111.6 grams) falling at Patwar which gives its name to the fall. However, two small additional stones from the villages of Fatehpur and Majhipara have been recovered and sent to the District Magistrate, Comilla; it is hoped that these will be received in time for them also to be exhibited at this November meeting of the Society.

The fall was accompanied by the usual phenomena of light and sound. A dazzling light following a 'loud rumbling noise' is supposed to have been the first indication to the villagers of the fall of the meteorite. The sound is stated to have been so loud and continued that those in the police thana at Chauddagam, some 7 miles to the north-east of Fatehpur, the nearest locality to the thana from where stones were recovered, distinctly heard it. Four reports 'like thunder' were heard in quick succession. One observer adds that a peculiar sound like 'that of an aeroplane' followed the reports; this may have reference to the passage through the atmosphere of the disrupted members of the parent meteorite.

The largest specimen penetrated the ground to a depth of 34 inches.

The parent meteorite appears to have been moving in a west-south-westerly direction. The smallest pieces fell first, followed in succession by the larger. The total rectangular area covered by the shower is roughly about  $4\frac{1}{2}$  square miles, the length being some three miles in the direction E.S.E.-W.S.W.

The meteorite has great interest on account of its rather rare composition. It belongs to the group of mesosiderites, being a siderolite intermediate in composition between a stone and an iron. It contains large crystals of olivine and masses of nickel-iron of fair size. It is composed chiefly of nickel-iron, with olivine, enstatite and bytownite, with smaller amounts of schreibersite, troilite, oldhamite, lawrencite and hydrocarbons. Its specific gravity is 4.21.

The Patwar mesosiderite will be described in a paper appearing in the *Records* of the Geological Survey of India. The specimens are exhibited by permission of the Director, Geological Survey of India.

Dr. Coulson stated that this was the third successive meeting of the Society at which he had exhibited meteorites. Consequently it was with considerable diffidence that he addressed the Members present, but he claimed their indulgence as the specimens of the Patwar meteoric shower of the 29th July, 1935, were of great scientific interest and rarity, belonging to the sub-group of mesosiderites intermediate between meteoric irons

and stones. In order that Members might note the intermediate character of the specimens of the Patwar shower, Dr. Coulson drew their attention to a specimen of the Bahjoi iron meteorite which Dr. Krishnan had exhibited at a previous meeting of the Society. Iron meteorites are far rarer in occurrence than stone meteorites and the Bahjoi meteorite, which fell on the 23rd July, 1934, in the Moradabad district of the United Provinces, was the first iron meteorite recovered in India since the shower of meteoric irons at Samelia in Rajputana on the 20th May, 1921, which was described by your President. The attention of members was also drawn to a typical specimen of a meteoric stone, one of the Perpeti meteoric shower of the 14th May, 1935, which Dr. Coulson had exhibited at the August meeting of the Society.

Dr. Coulson stated that Members would be pleased to learn that the two additional stones, each weighing about a kilogram, that had been mentioned in the account of to-day's exhibit, had been received by the Geological Survey and formed part of the specimens on the table. Altogether five specimens of a total weight of 37,353.28 grams had been recovered from the Patwar fall and this made the fall rank third in the total amount recovered from any particular meteorite fall and in the possession of the Geological Survey of India. It was exceeded by the Merua fall of August 30th, 1920 (71,406 grams), and the Kuttippuram fall of April 6th, 1914 (38,437 grams).

It was interesting to note that the largest stone, weighing some 23 kg., had penetrated the soft ground to a depth of 34 inches, whilst the two next largest stones had penetrated 24 inches. Details as to the depth at which the smallest stones were recovered, were not available.

The third largest stone had been cut in two for purposes of study and the cut surfaces had been highly polished. The structure of the mesosiderite showed up well on the polished surface. The large crystals were either composed solely of olivine or of a granular aggregate of olivine and bytownite feldspar. The dull metallic-looking mineral was nickel-iron in one or other of its various alloys. The other minerals present were given in the account of the exhibit.

Finally Dr. Coulson drew attention to the proximity of this fall to the Perpeti fall, Perpeti being some 17 miles north-west of Patwar. The composition of the two meteorites was totally dissimilar, however. He added that while the Perpeti shower covered a rectangular area of some 15 square miles with the shorter side of three miles in the direction of flight of the parent meteorite before it was disrupted, the Patwar shower covered the much smaller area of  $4\frac{1}{2}$  square miles, the longer side of three miles being in the original direction of flight.

The President in inviting discussion upon Dr. Coulson's exhibit said that he did not share Dr. Coulson's regrets that he (Dr. Coulson) had had occasion to address the Society upon meteorites at three successive meetings. Considering the great interest inherent in these visitors from outer space everyone would agree that there would be a welcome for all the exhibits of meteorite material that could be placed before the Society.

The present meteorite was one of exceptional interest in that it was a mesosiderite occupying an intermediate position between stony and iron meteorites. Although many meteorites had fallen during his service in India Sir Lewis could not recall that any one of them had been a mesosiderite.

Prof. J. N. Mukherji asked whether any systematic determination of the atomic weights of elements found in meteorites had ever been carried out.

Dr. Coulson replied that he was not aware of any recent research in this direction.

Baron W. Ow-Wachendorf drew attention to the locally so-called 'meteoric iron' surrounding diamonds in South-West Africa. Was that iron really meteoric or was it ironstone derived by lateritic processes from the gravels?

Dr. Coulson replied that probably the latter explanation of the origin of the ironstone was the correct one. Diamonds of course were known to occur in iron meteorites, but it was most unlikely that the 'iron' surrounding the diamonds in the gravels was actually iron and not one of the oxides, and that it had a meteoric origin. Baron Ow-Wachendorf was no doubt aware that it was at Hoba in South-West Africa that the largest known iron meteorite occurred—this weighed 60 metric tons and was still *in situ*.

Mr. H. Hobbs asked if there were any elements in meteorites that had not been found in the rocks of the earth's crust.

Dr. Coulson replied that there were no such elements. Not all the elements found terrestrially, however, had been found in meteorites, those of high atomic weight, with the exception of the platinum metals, generally being absent from meteorites. The apparent universal absence of barium and strontium may perhaps be accounted for by the paucity of felspathic minerals in the meteorites examined. It was interesting to note that there were two minerals occurring in meteorites that had not been detected in terrestrial rocks as they could not exist unaltered in the conditions of oxidation characterising the crustal regions. The minerals were oldhamite, the sulphide of calcium named after a former Director of the Geological Survey of India, and schreibersite, a phosphide of iron, nickel and cobalt.

Mr. Van Manen referred to the article on 'Meteorite' in the 'Encyclopaedia Britannica' and stated that he would like further information with regard to three statements made therein. The first was the statement regarding the general similarity of meteorites in chemical composition and the fact that they were supposed to be derived from a single celestial body. The second statement was to the effect that though the earliest recorded fall in China was about 644 B.C., strange to say, until quite recently, no meteorite in that country appears to have been preserved. Was this due to any geographical immunity of China from meteorite falls or to some superstitious awe in which meteorites were held being responsible for their being destroyed by the inhabitants? The third statement was to the effect that with the exception of one meteoric iron found in Pliocene gravels in the Klondike, 'fossil' meteorites are unknown. What was the sense in which the term 'fossil' was used?

Dr. Coulson replied that he was pleased that Mr. Van Manen had raised these three points as he recently had had occasion to refer to the article in question when preparing material for a lecture delivered before the Mining and Geological Institute of India at Dhanbad.

The first question raised the vexed problem as to the origin of meteorites. Members were aware of the nature of comets with their relatively small mass spread through a large volume of space. The tails of comets are in a much more finely divided state than the heads which are made up of fairly large lumps for which the gravitational force is stronger than the repulsive force from the sun which affects the tails. These lumps are some feet in diameter comparable in size with large meteorites. Comets are part of the solar system which contains a very large number of them. Their orbits are elliptical and some of the long-period comets can recede away from the sun quite a large fraction of the 25,000,000,000,000 miles separating us from the nearest fixed star. It has been suggested that meteorites are identical with the material of comets and in that case to be moving through space in swarms with definite orbits. However, while certain meteorites may perhaps be the debris of comets, we must look elsewhere for the origin of the greater number of them.

Dr. Coulson referred briefly to meteors, which term is restricted to those cosmical bodies which, entering the earth's atmosphere from without and shooting across the sky, give the appearance of a bright star in rapid motion. Meteors are only a few milligrams in weight but it has been held by some that there is a gradual transition from them to meteorites.

However a study of the times of occurrence of meteor showers shows that they do not agree with meteorites in the months in which they are most plentiful and, also, only one meteorite, the Mazapil iron, has been known to fall during a shooting star display. It has been shown, in addition, that though there is an intimate connection between the orbits of comets and some meteor streams, yet many of the meteors must have come from solar systems other than our own. The parabolic velocity of 26 miles per second, which a body falling from rest at an infinite distance towards the sun attains when it passes the earth's orbit, is the maximum that a body can have if it originated in our solar system. Of course when considering the maximum velocity that a meteorite can have relative to the earth, due account must be made of the velocity of the earth in its orbit. Taking into account also the velocity due to the earth's attraction and neglecting the earth's surface velocity, the maximum velocity relative to the earth with which a meteorite can fall if it originated in our solar system is about 47.4 miles per second and the least about 8.2 miles per second. It has been calculated from the observed velocities of meteors that certain of them must have originated in solar systems other than our own.

If most meteorites have been derived from the disruption of a planet or planetoid in the solar system, the question naturally arises as to when this disruption took place. Here we have the assistance of the very valuable work performed recently by F. Paneth and his assistants in the measurement of the helium content of iron meteorites with a very sensitive apparatus. If meteorites are the scattered portions of our solar system, then their age cannot be greater than that of the solar system itself which is assumed to be about 3,000,000,000 years at the utmost. If, however, meteorites came from other stars, it is possible that the period of their solidification could date back some 10,000,000,000,000 years. Not one of the iron meteorites studied had been found to be older than 2,900,000,000 years and so the solidification date accords well with the assumption that iron meteorites, and we may presume stone meteorites as well, originated not from distant celestial bodies but from our solar system. The date of solidification, also, ranges in time almost up to the date of the birth of the earth and the solar system and it may be that meteorites represent ungarnered fragments from the birth of the solar system and not the product of the later disruption of a planet or planetoid.

With regard to Mr. Van Manen's question concerning the absence of meteorites from China, there is no fundamental reason why meteorites should be more numerous upon one part of the earth's surface than on another. There is thus no reason to presume that meteorites have not fallen in China just as frequently as in other parts of the world and the absence of records may be due to some such cause as suggested by Mr. Van Manen.

The term 'fossil' meteorite was used in the usual sense of the word 'fossil' as being something, in this case a meteorite, entombed in strata that was being laid down contemporaneously. The absence of fossil meteorites, except for the single case of one in the Pliocene gravels of the Klondike, may be due to weathering, metamorphic and other agencies so altering meteorites as to render them unrecognizable as such.

*The President*, referring to the question of the rarity of fossil meteorites, expressed the view that no satisfactory conclusion could be drawn from the absence of fossil meteorites from all geological formations except for the single case from the Pliocene gravels of the Klondike. Meteorites appear never to have penetrated far below the surface of the earth, except possibly in the case of meteorite craters; further stony meteorites are very susceptible to weathering, with the result that the collections of the world contain only those stony meteorites that have actually been seen to fall. The number of iron meteorites in the collections of the world is of the same order of magnitude as the number of stony meteorites, but only a very small proportion of these iron meteorites have been seen

to fall, the majority of the irons in collections have been found lying on the surface, usually in desert countries such as Chili, South-West Africa, and Australia, where there are no accumulations of vegetation to hide them. Falls of irons are in fact very much rarer than those of stones.

Considering the rarity of meteoritic falls of either composition as compared with the total mass of stratigraphical deposits, and the great liability to decomposition of the commoner of these, the stony meteorites, the chances of finding fossil meteorites enclosed in geological formations appeared to the speaker to be so remote that no conclusion could be drawn from such negative evidence on the date of disruption of the celestial body from which these meteorites must have been derived.

Sir *Lewis* expressed the opinion that concerning the possible sources from which meteorites may have been derived two hypotheses are worthy of serious consideration. One hypothesis is that the solar system was formed from the disruption of a primordial dark sun, due to the close passage of a stellar body from outer space, which by tidal attraction tore off the crust of our dark sun, scattering fragments of this crust into space and exposing the still hot centre of our sun. The disturbing body then passed on and our sun regained gravitational control of its scattered crust with the formation of the planets. Many fragments have naturally remained ungarnered through the ages, and some of these continue to fall into the earth and are the source of the supply of our collections.

The other attractive hypothesis is that which ascribes the formation of the meteorites to a somewhat later date, namely the date of departure of the moon from the earth, assuming that when this happened the earth already had a solid crust. On this hypothesis the meteorites that we now receive represent samples of our earlier earth returning to us.

Each of these hypotheses necessitates the view that the primordial body, either sun or earth, had a solid crust, and enables us to assume that the stony meteorites, the mesosiderites, and the iron meteorites, represent successively deeper levels below the surface of the primordial body.

The investigation into the helium contents of meteorites may enable a choice to be made between these two hypotheses, but this will only be possible if the source of the helium contained in meteorites is known.

Mr. *Hobbs* asked whether hailstones could be termed meteorites.

Mr. *Van Manen* said that in accordance with the etymological sense the word meteor was used by the ancient Greeks for all 'things of the air', or atmospheric phenomena in general, including clouds, cyclones, typhoons, the aurora borealis, ignis fatuus, and rainbows. According to this use of the term airships may perhaps be called meteors. The word meteorite is defined in an authoritative work of reference as a mass of matter from outer space which has fallen upon the earth's surface. As hail is not formed in outer space, hailstones (nor, for the matter of that, snow flakes or drops of rain or 'rains of fishes', of which we have recently heard so much) can strictly be called meteorites.

However, an interesting quotation from Bishop Hall in Webster's *New International Dictionary* speaks of 'Hail, an ordinary meteor'. The same dictionary states that meteorite is 'loosely' used for meteor or meteoroid. Whittier had written:—

'In starry flake, and pellicle, All day the hoary meteor fell.'

The matter afforded a good example of verbal 'relativity'.

Mr. *H. Hobbs* referred to the obliquity of fall of certain meteorites and asked for further information in this respect.

Dr. *Coulson* stated that it was usual for meteorites to form small holes when they reached the earth's surface but the nature and obliquity of that hole depended upon the speed of the meteorite. He had already referred to the very great differences in velocity with which it was possible

for a meteorite that had originated in the solar system to reach the earth's surface. The cosmical velocity of meteorites was slowed up by the resistance of the earth's atmosphere. Schiaparelli had made experiments on a small ball,  $1\frac{1}{2}$  inches in diameter, of specific gravity 3.5. He had calculated that with an initial velocity of nine miles per second, the ball would have a velocity of one-third of a mile per second when it arrived at a point where the barometric pressure was one-sixty-sixth of the earth's surface atmospheric pressure; if the original velocity were 40 miles per second, then the reduction in velocity at the same point would be greater. Thus very frequently meteorites lost their cosmical velocities and fell to earth under the attraction of the earth alone and the heights from which certain meteorites had done this had been calculated by Niessl.

The direction of penetration of a meteorite is not always vertical since the direction of motion of the meteorite is sometimes tangential. Thus the largest stone of the Knyahinya fall penetrated the earth to a depth of 11 feet in a hole which was inclined to the vertical by as much as  $27^\circ$ . Smaller deviations from the vertical are common.

Mr. W. D. West referred to the fact that in the current number of *Nature*, there was a letter by Mr. M. A. R. Khan discussing the authenticity of persons ever having been killed by falling meteorites. Could Dr. Coulson throw any further light on the matter?

Dr. Coulson replied that he was unable to throw any further light on the subject but stated for the benefit of Members that the letter in question was written with reference to a review in *Nature* of Heide's 'Kleine Meteoritenkunde' in which it was stated that there is no certain evidence of any person having been killed by a falling meteorite. Mr. Khan referred amongst others to two Indian cases in 1827 and 1870 but the writer of the review concluded that unless the two cases in question are better substantiated than the others mentioned by Mr. Khan, he preferred to accept Professor Heide's statement that 'noch kein einziger, sicher beglaubigter Fall ist vorgekommen, dass ein Mensch von einem Meteoriten erschlagen oder verletzt worden ist'.

Dr. Coulson added that Members would be interested to learn that one of the cases of a near escape cited by Mr. Khan was that of a shepherd at a distance of 12 paces from whom one of the stones of the Naaki meteorite shower of the 29th September, 1928, was stated to have fallen. Dr. Coulson had described this shower in the *Records* of the Geological Survey of India.

The President said that although there appeared to be no definite record of human beings ever having been killed either by falling meteorites or by hailstones, yet there was the record in the Bible of the stones which fell down from heaven. 'And it came to pass that the Lord cast down great stones from heaven upon them.' (Joshua 10, 11.) It is evident that these stones must either have been meteorites or hailstones.

Mr. Hobbs stated that he had a cutting from a newspaper giving a record of the death of two persons from falling meteorites.

Dr. Coulson said he would like to see this report.

Mr. L. R. Fawcett drew the attention of Members to the Greek story of Aeschylus being killed by a falling turtle dropped on his head by an eagle. It might be possible that this story had reference to the fall of a meteorite.

Mr. Van Manen referred to the general Indian belief that falling coconuts never harm or kill people.

### 3. JOHAN VAN MANEN.—*Some Tibetan Tankas.*

Of late years increasing interest has been shown in Tibetan scroll-paintings, or *tankas*. G. de Roerich has in 1925 published a valuable monograph on the subject in which a large number of such *tankas* were reproduced. An appreciable amount of

material on the subject is now available in print. The statement made in 1925 that 'our present knowledge of Tibetan pictorial art is not sufficient to enable us to discuss various schools of art' remains true.

It is, nevertheless, possible to discuss special points which from time to time arise. The purpose of this exhibit is to draw attention to a style of painting of a very distinct character, of which the examples known to the exhibitor are of a high artistic quality. The style is in contradiction to the one of the majority of *tankas*, which are executed in a great variety of colours on the same scroll, and is limited to the use of a black background with all outlines in thin gold lines and the use of only red, or red and white, to colour clothing and skin.

A few samples are exhibited, showing various stages of development, and for purposes of comparison samples of the more common type of *tanka* are placed in juxtaposition.

Mr. Van Manen said that though all present would probably have seen many *tankas*, they might not realize how scanty detailed knowledge was on the subject of this fascinating kind of Tibetan art. Safe canons for dating had not yet been evolved and this particular branch of enquiry was complicated. Presumable age was often a matter of appearance. Tibetans scarcely ever date their *tankas*, but the Nepalese very often date theirs. From such dates it was apparent that the freshness of a *tanka* was greatly influenced by the manner of its preservation. Copies that looked recent might have dates going back as much as three or four centuries, simply because they had been carefully preserved. Other specimens might appear old though their dates showed their newness, again simply because they had been carelessly kept and roughly handled. Ritual fumigation was an important element in this matter. Though it was true that in modern times stereotyped models had been and were being reproduced as copies, recognizable by crudeness of colouring and uncertainty of outline, it was equally evident that there are many bad old pictures as well as good new ones. A similar uncertainty existed with reference to schools. Though different types may be recognized the time for classification has not yet come. The speaker would however suggest that at least one broad division may already be made, however general such a division would have to remain for the present. He thought there was a definite difference between what he would call the Indo-Tibetan style and the Sino-Tibetan style. A curious observation which he has made was that a small number of *tankas* which he had seen looked almost Japanese-Tibetan. He would however not enter into that matter. Quite apart from date or school there is a division according to manner. In his own collection he had a few specimens of an entirely rare kind, more or less modernistic, and executed in a crayon-like manner. His subject for the evening was limited to a class of paintings described in the introductory paragraph on the programme. He had the impression that these specimens must be old, an opinion, endorsed, for what it may be worth, by his Tibetan friends. The outlines were well-finished and delicate. There was a sureness of touch of remarkable vigour and skill. The devils were ugly, but they were meant to be ugly. The accessory figures showed graceful delicacy: miniatures of high quality. He had enquired whether this type of painting might be related to a particular sect, and specially whether it might perhaps be reserved for Tantric representations. He was told that this was not the case. He would leave the matter there and invited the audience to inspect the *tankas* in detail.



Mr. Percy Brown remarked :—

As to the age and other particulars of the Tibetan Temple Banners or Tangkas, as these have been prepared for centuries almost always according to the same conventions and traditions, it is difficult to classify them into any reliable periods. Some of the tangkas recovered by Sir Aurel Stein from sites in Eastern Turkestan and known to date from 8th, 9th and 10th centuries A.D. differ very little in subject-matter and technique from those prepared at the present time. Appearance and condition is also an unreliable guide, as some tangkas exposed on the walls of the *gompas* speedily take on a deposit of smoke and look very old, while others carefully rolled up retain their fresh colouring for a long period.

It is doubtful whether much help in classifying and dating these banners can be expected from the monasteries, as these institutions have little reliable knowledge on the subject, although occasionally some valuable and intelligent information is forthcoming from these sources. It is more likely that a beginning will come from India, either through inscriptional evidence or by comparing the technique of these tangkas with that of some of the Indian schools of painting. Once a fixed point is indicated and a start made some progress may be anticipated, but at present any dating of these is very largely speculation.



#### DECEMBER, 1935.

An Ordinary Monthly Meeting of the Asiatic Society of Bengal was held on Monday, the 2nd, at 5-30 P.M.

#### PRESENT.

SIR LEWIS FERMOR, KT., O.B.E., D.Sc., A.R.S.M., F.G.S., M.INST.M.M., F.R.S., F.A.S.B., President. in the Chair.

#### Members :

Agharkar, Dr. S. P.  
Auden, Mr. J. B.  
Bogdanov, Mr. L.  
Brahmachari, Sir U. N.  
Brandt, Dr. A. Klebe  
Brown, Mr. Percy  
Chanda, R.B. R.  
Chakrabarti, Mr. S. K.  
Chatterjee, Mr. P. P.  
Chatterji, Dr. S. K.  
Coulson, Dr. A. L.  
Darbari, Mr. M. D.  
Dey, Mr. Mukul  
Driver, Mr. D. C.

Dutt, Mr. M. N.  
Gangoly, Mr. O. C.  
Haq, Mr. M. Mahfuz-ul  
Heron, Dr. A. M.  
Hobbs, Mr. H.  
Hora, Dr. S. L.  
Majumdar, Mr. N. G.  
Manen, Mr. Johan van  
Neogi, Dr. P.  
Olpadvala, Mr. E. S.  
Prashad, Dr. Baini  
Rao, Mr. U. S.  
Stagg, Lt.-Col. M.  
West, Mr. W. D.

#### Visitors :

Brown, Mrs. Percy  
Fermor, Lady

Pulley, Lt.-Col. O. C.  
Sarkar, Sir Jadunath

The minutes of the last meeting were read and confirmed.

The General Secretary reported receipt of six presentations of books, etc., which had been placed on the table for inspection.

The General Secretary announced that the following candidate would be balloted for as an Ordinary Member :—

(29) *Blakiston, J. F.*, Director-General of Archæology, New Delhi.

Proposer : Sir Lewis Fernor.

Seconder : A. M. Heron.

The General Secretary reported the death of :

Dr. H. F. Osborn (An Anniversary Centenary Member, 1934).

Dr. Bains Prashad read an obituary notice of Dr. Osborn (see page 221).

The General Secretary reported the following loss of membership, since the previous meeting, by death :—

(13) F. Williamson (An Ordinary Member, 1934).

The General Secretary reported the following loss of membership, since the previous meeting, by resignation :—

(20) Karmajogi Ray (An Ordinary Member, 1934).

The General Secretary reported that there had been no lapses of election, since the previous meeting, under Rule 9.

The General Secretary reported that there had been no withdrawals of application, since the previous meeting.

In accordance with Rule 48(a), the General Secretary reported that the Council had adopted certain Regulations regarding the award of the Indian Science Congress, Calcutta Prize, last year, which had not been announced in the Monthly Meeting as usual.

The Regulations are as follows :—

REGULATIONS REGARDING THE AWARD OF THE INDIAN SCIENCE  
CONGRESS CALCUTTA MEDAL.

- (1) The Medal shall ordinarily be awarded at the Ordinary Annual Meeting of the Asiatic Society of Bengal, in February, in such years as the session of the Congress is held in Calcutta.
- (2) The Medal shall be bestowed on a person who, in the opinion of the Council, has rendered conspicuously important services to the Indian Science Congress, or on a Member of the Indian Science Congress who, in the opinion of the Council, has made conspicuously important contributions to science.
- (3) In any year preceding one in which the award will be due the Council shall, at a meeting preceding the Ordinary Monthly Meeting in November, appoint an Advisory Board consisting of not less than Five Members.
- (4) The Advisory Board shall be termed 'The Indian Science Congress Calcutta Medal Advisory Board'. This Board shall include the Biology, Physical Science, Anthropology, Medical and General Secretaries. The Board shall appoint a Chairman from amongst its members who shall have a casting vote (in addition to his own vote) in the event of the number of votes being equally divided.
- (5) The General Secretary shall call a meeting of the Advisory Board on the first convenient date subsequent to the first Monday of December, at the same time requesting members to bring with them to the meeting detailed statements of the

work or attainments of such candidates as they may wish to propose. The General Secretary shall also place before the Board for consideration detailed statements of the work or attainments of any other candidate submitted by any Fellow of the Society. The Board shall make such arrangements as may be necessary for the selection of a name to be submitted to the Council at its December meeting.

- (6) The Advisory Board shall submit to the Council the name of the person to whom, in the Board's opinion, the Medal should be awarded. It shall be open to the Board to report to the Council that no award should be made for the year; and, in such case, provided the Council concurs, a new Advisory Board shall be constituted in the following year, and so on, from year to year, in the manner prescribed above, till recommendation is made for an award and accepted by the Council. The period mentioned in Regulation (1) shall always be counted from the year of the award.

Papers were presented, and Exhibits were shown and commented upon, as detailed below.

The Chairman announced the result of the ballot for the election of the Ordinary Member and declared that the candidate has been duly elected.

The Chairman announced that a meeting of the Medical Section had been arranged to be held on Tuesday, the 17th December, at 6 P.M.

The following papers were presented :—

1. N. L. BOR.—*The Oath among the Daflas.*

Introductory note on the locality, history, and characteristics of the Daflas.

The psychological background. The sorcerer and his stock-in-trade.

The sorcerer's implements and materials. The association of ideas connected with them. The sacrificial post.

Two classes of oaths : of ultimate and immediate results.

Ordeals by boiling water and hot iron. Record of cases observed.

Detailed descriptions of the oath on the tiger's tooth, the oath followed by an ordeal by boiling water, the oath followed by an ordeal by red-hot iron, and the 'death'-oath.

In the absence of the author Rai Bahadur R. Chanda presented the paper, giving an abstract of its contents. He said that the paper was well-written and contained valuable information. He had to draw the attention of his hearers to one remarkable aspect of the paper. The author reported some strange cases of ordeals, one by boiling water, and two others where death followed after the taking of a false oath. The last two might be attributed to natural cases, but the ordeal by fire was incredible. He doubted whether the author took proper steps beforehand to prevent deception. The hand of the subject should have been examined before he was allowed to dip it into boiling water, and again when he took it out. Such records were certainly of value but should be critically examined. The speaker referred to the well-known dry-rice ordeal prevalent throughout India, based on the fact that a nervous condition of the subject prevented normal salivation.

Sir *Lewis Fermor* remarked that a rational scientific explanation was possible of the case of a person undergoing successfully the ordeal of plunging his hand into boiling water or oil or molten lead. All that was necessary was for the hand, prior to immersion, to be coated with some substance that on volatilization would produce a protecting covering of vapour round the hand so as to prevent the boiling or molten liquid from coming in actual contact with the hand. This was the basis of the well-known *Leidenfrosts* phenomenon, in which a liquid in the spheroidal state is supported on a cushion of its own vapour.

He might claim to have undergone ordeal by liquid oxygen, when at College a drop of liquid oxygen was poured into the palm of his hand. The temperature of this liquid oxygen was, of course, nearly 200° below zero centigrade, and had the liquid come in contact with his hand, it would have produced a very severe burn. The secret of surviving such ordeals satisfactorily was to make their duration as short as possible and to remove the hand before the protecting cushion of vapour had disappeared and thus permitted the cold or hot liquid actually to make contact with the hand.

Mr. *Van Manen* said that he considered the word incredible too strong an expression, indicating a prejudgment. Though caution and discrimination were always desirable they should not extend to *a priori* scepticism. The subject of ordeals had an extensive history. Natural explanations of strange observations had often been plausibly given. He remembered a discussion on ordeals by liquid resin in the Dutch East Indies in which it was suggested that the richer of the parties concerned bribed the officiating priest to furnish resin with a lower melting point than to his poorer rival. Other fire ordeals had been explained by a previous coating with alum invisible to superficial observation. On the other hand there were records of such strange phenomena as stigmata, immunity to pain in a hypnotic condition, hypnotic rigidity, and so on, and the whole range of instances of susceptibility to suggestion amongst primitive races, self-induced or otherwise. One should carefully refrain from dogmatic scepticism. If a careful and unsuspected observer gave a detailed record of observations in the field, closet-students in the city should not immediately lay down what can and cannot be. We should remember the gibe in Goethe's *Faust* where Mephistopheles says:—

Daran erkenn' ich den gelehrten Herrn!  
Was ihr nicht tastet, steht euch meilenfern;  
Was ihr nicht fasst, das fehlt euch ganz und gar;  
Was ihr nicht rechnet, glaubt ihr, sei nicht wahr;  
Was ihr nicht wägt, hat für euch kein Gewicht;  
Was ihr nicht münzt, das, meint ihr, gelte nicht.

It was better to listen, and to file provisionally for reference, until sufficient data for analysis and judgment should be available, than to judge prematurely. As far as the reported cases of death were concerned, there existed ample testimony concerning remarkable cases, amongst nature people, of a power to 'give up the hold on life', of people simply determining not to continue living and duly dying in consequence. *Bodding* has an interesting passage on this subject in his *The Santals and Disease*, p. 8.

Prof. *P. Neogi* said that ordeals have psychological bearings. The well-known 'rice' ordeal is based on the psychological difference in the culprit and the innocent person causing the secretion of different quantities of saliva. The result would be that the rice coming out of the mouth of the culprit would be dry, as he would be so frightened out of his wits as not to secrete any saliva, whilst the innocent person would secrete a sufficient amount to moisten the rice.

In the case of the 'boiling water' ordeal mentioned in the paper the culprit would be afraid to put his hand into the water. The innocent

man would keep his hand perhaps too long in it in order to prove his innocence and hence might get his hand scalded.

Mr. U. Shanker Rao drew attention to the recently reported fire-walking test made in London. Pictures had appeared in the *Daily Mirror* and other illustrated papers. The subject had been discussed in one of the recent numbers of *Nature*. The speaker registered his disagreement with the attitude of Rai Bahadur R. P. Chanda.

Dr. Baini Prashad remarked that Mr. Bor's observations were of value as records of oaths, and were not submitted as critical studies on or explanations of the ordeals undergone by the Daffas in connection with oaths on special occasions.

Mr. P. P. Chatterjee said :—

Compurgation and ordeals—such as putting the hands into boiling water, walking on red-hot iron, etc.—are spoken of as prevalent among the Druids in old Britain. In India also such ordeals were common in ancient days. Fire ordeals are sometimes explained by the suggestion that at a certain very high temperature the hand will not, in accordance with some law of thermo-dynamics, be injured or equally so through some psychological factor in accordance with the law of dominant mental impression. Either the phenomenon is the result of the operation of some law of thermo-dynamics, or due to the action of the law of dominant mental impression on the subconscious mind, a subject for the experts in psychology or calorimetry. In his remarks the speaker had assumed it to be a fact that innocent persons had in many cases come out of the ordeals unhurt, as history had recorded such cases; otherwise trial by compurgation or ordeal would not have remained prevalent for so long a time.

Mr. Chanda replying to the various speakers said that he had no quarrel with them in so far as they pleaded for the open mind. On the other hand openmindedness should not do away with a critical and scientific spirit. Caution should not go to the other extreme of credulity. He wished to make it clear that what he had said had not been intended in a spirit of prejudgment. All present would admit that the subject of ordeals was a mysterious one, as well as an interesting one, and that Mr. Bor had given a valuable description but no definite explanation.

Sir Lewis Fermor remarked that the aim of the paper was not to elicit a general discussion on the subject of judgments by ordeals and suggested that if no one had any further remarks to submit regarding the oaths of primitive people in general or of the Daffas in particular the meeting might now pass on to the next paper.

## 2. M. DHARMARAJAN.—*Anatomy of Otolithus ruber* (Bl. & Schm.). Part I. Endoskeleton.

Among the students of Zoology in the South Indian colleges, there has been a long-felt need for a suitable work dealing with the anatomy of a local Teleostean fish. With a view to supplying this demand the author has chosen *Otolithus ruber*, a large and edible species of Sciaenid fish, common throughout the Coromandel Coast, and in this paper a complete account of its endoskeleton is given. Detailed descriptions of all the principal sections of the axial and appendicular skeleton are given with illustrations.

In the absence of the author Dr. S. L. Hora communicated the gist of the paper and remarked that a subject of this nature does not lend itself to being read out in detail. The material is only useful to those who study this species of fish, as a type, in South Indian Universities, or to specialists who may use the data so laboriously collected by the author for purposes of a comparative study of fish skeletons. Last

year the Society had published a similar paper on the skeleton of Rohu (*Labeo rohita*) for the benefit of Northern Indian Universities, and in publishing the present paper the Society would be helping the Universities in the South. The students of zoology in India had hitherto been studying European types and had consequently considerable difficulties in obtaining the necessary material in a proper state of preservation. Within the last decade several valuable memoirs had appeared on Indian types and the teachers and students were finding them very useful. The present paper would be a valuable addition to suchlike memoirs and it was hoped that the author would not delay the publication of an account of the soft parts to complete the memoir.

The following exhibits were shown and commented upon:—

1. SIR LEWIS FERMOR.—*An Iron Horse from the Central Provinces.*

This exhibit was obtained some 32 years ago from the top of a hill of manganese-ore in the Chhindwara district. The manganese-ore cropped out in large black masses, which in one place had been daubed with red paint and treated as a village god. Lying about were a number of clay horses and an iron one. This hill has since been worked as a manganese mine, and is now represented by a large hole in the ground.

The interest of this specimen is perhaps three-fold. In the first place it has been exposed to the moist air of Calcutta for over 31 years, without any appearance of rust, from which one can deduce that it is made of very pure iron, as in the case of the iron pillar at Delhi. Its age, of course, is unknown.

The second point of interest is that it must be regarded as an example of primitive art. It is made mainly from three pieces of iron—one piece forming the head, the body and the tail, another piece the front pair of legs, and a third piece the hind pair. The way in which the pairs of legs are bent over the body provides a representation of a saddle. In addition, there are two extra small pieces of iron welded on to form the ears. Two touches of vermilion on the head suggest the eyes. The horse is so constructed as to be unstable when standing on its four feet, but to be stable standing on a tripod consisting of its hind legs and tail. It is a little over 7 inches long, and is in consequence less than one hand high!

I have shown this horse on occasion to many people, and no one appears to have seen a similar horse before, but—and this is the third point of interest—it has been suggested to me that it should be compared with the horses that are offered to the Southern Indian village deity known as Iyenar—a beneficent male deity, who is regarded as the village watchman and whose duty is to patrol the village and fields at night. If this suggestion is correct, it is an indication of the extension of this South Indian deity as far north as the Chhindwara district in the Central Provinces. An account of Iyenar is given in Bishop Whitehead's 'Village Gods of Southern India'. These village

gods, according to Bishop Whitehead, date from before the Aryan invasion and must be regarded as Dravidian deities. The Gonds of the Central Provinces are, of course, Dravidians, and it is not, therefore, surprising that worship of this deity Iyenar may have extended to the Central Provinces. I was not, however, given any name for the deity, and have no knowledge whether there is any local name for Iyenar in the Central Provinces.

After showing his exhibit and explaining it in the terms of the description given in the meeting notice, Sir *Lewis Fermor* invited Professor *P. Neogi*, as an authority on the subject of iron in ancient India, to contribute to the discussion.

Professor *Neogi* said:—

As regards the iron in the horse it is to be remembered that after the Neolithic age Northern India had a copper age and Southern India an iron age so far as implements are concerned. All iron, beginning with the iron pillar at Delhi to the iron pillars at Dhor and Mount Abu, the girders of Puri, Bhubaneswar, and Konarak, down to the Mughul cannons, has been found on analysis to be pure wrought iron. Therefore, without analysis it can safely be said that the iron of the horse now exhibited is pure wrought iron.

As regards the ethnological importance of the exhibit, it is rather remarkable that Aryan mythology has many animals as the mounts of Aryan gods and goddesses, such as the lion, the peacock, the eagle, the elephant, and even the mouse, but not the horse (except perhaps as a duplicate mount of Indra, and as connected with the sun-god with seven horses to his chariot). The iron horse therefore may be of Dravidian and not of Aryan origin. The primitive nature of the workmanship of the horse points perhaps to a prehistoric age and if that should be proven to be actually the case the exhibit would be an important one in the history of iron in ancient India.

Mr. *U. S. Rao* remarked:—

A point of particular interest, specially to naval architects and marine engineers, is whether this metal has been rested by immersing in salt water and examined as to whether it would remain clean without the appearance of rust. If it were possible to manufacture this metal so that it should not rust even in contact with salt water it would probably revolutionize ship building.

Mr. *Percy Brown* remarked:—

With regard to the statement in Sir *Lewis Fermor's* note that 'lying about were a number of clay-horses', Mr. *Percy Brown* observed that on more than one occasion in the Punjab his attention had been called to a collection of small terra-cotta models of horses forming a mound near a shrine. These ranged from a mass of old and disintegrated examples in the centre of the pile to a number of perfect specimens on the fringes which had apparently only recently been added. In answer to his enquiry he was told that a saint, or *fakir* was buried on the spot, who during his lifetime had shown an exceptional fondness for horses, an explanation which however he did not consider altogether satisfying.

As to the particular horse exhibited by Sir *Lewis*, he noticed that its true pose was evidently rampant, and that that posture was always the one represented in the seven coursers of *Sūrya*. He therefore raised the question as to whether this iron example was not one of the steeds of the Sun God, indicating that the mount was associated with Sun-worship.

In any case a most interesting fact connected with this particular specimen was its artistic character, for as a type of primitive art, it was in a class by itself. In view of the cult in Europe for works of this nature, of primitive and elemental art often of vast antiquity, he thought that if it were exhibited there it would create no little sensation.

Mr. *Van Manen* referred to the custom amongst the Bhils of making offerings of rude images of horses. It had been suggested that these horse-images may be intended as steeds on which the spirits of the dead may ride to heaven. The Koravas believe that after death a good man's spirit may enter the body of a horse, a cow, or some other higher animal. In Gujrat the worship of Ghora Dev, the horse-god, is common, and clay images of horses are placed round a central shrine. The Gonds likewise have a Ghor Deo, or horse-god, also named Koda Pen.

With reference to the South Indian horses, striking figures, often of considerable dimensions, standing in little groups in fields on the outskirts of villages, he would indulge in a curious speculation. He recalled a story in the *Arabian Nights*, which he for the moment could not locate again, speaking of such horses, petrified during the day and coming to life in the night. He wondered whether this story had its origin in the South Indian custom.

Though not strictly relevant to the topic under discussion he would like to mention that Mr. Chintaharan Chakravarti had told him that a story regarding Urvāśi being transformed into a horse by day, resuming her own shape by night, occurs in the *Dandī-parva*, a well-known old Bengali composition. The Kinnaras have horse-faces (*turaṅga-vadana*). In the ritual literature of Bengal a number of old Bengali MSS. refer to a deity called Trailokyadeva or Trailokya Pir who rides on a golden horse with a silver saddle. A hymn attributed to Śaṅkarācārya mentions horses and horse-borne chariots among the 64 objects offered to the supreme goddess, Śakti.

The place of the horse in Indian folklore, mythology and superstition was an interesting subject of study. We lacked for India a treatment similar to that under the word Horse (Pferd), and its combinations, in the magnificent German cyclopædia of German superstition. He would however draw attention to Van Gulik's recent monograph on *Hayagrīva : the Mantrāyanic Aspect of the horse-cult in China and Japan*, Leiden, 1935.

Sir *Lewis Fermor* observed that his horse was not a god to whom offerings were made, but the offering itself.

Mr. *Mukul Dey* said :—

All Indian potters of to-day still make clay horses for the Goddess Śitalā, who rides on a donkey. People supplicate Śitalā against small-pox, cholera and other diseases. In every village one may find such horses, and in some cases elephants, lying under trees, where the villagers come to worship them periodically.

Dr. *Sunīti Kumar Chatterji* said :—

The cult of the horse is an old one in India. In the *Rg-Veda* we have already *Dadhikrāvan*, a divine horse, a form of *Agni*, the fire god. Even at the present day it prevails all over India, and it forms part of the popular religion, Hindu or Musalman. The shrines of Muhammadan *Pirs* or Saints usually have crude terra-cotta horses as votive offerings, heaps of these sometimes being found near popular shrines. Actually some of these *Pirs* are known as *Ghorā-Pirs* or Horse Saints from these offerings. No one can tell why figures of horses are offered to Musalman *Pirs* : but this would seem to be merely a survival in popular Islam of an older cult replaced by it, at least outwardly. The old gods never die, or are at least very hard in dying. Probably a horse-cult was known in Pre-Aryan India, and it has continued down to our day. Images



of horses are offered also to some Hindu temples, particularly in West Bengal. In the Bankura district, figures of terra-cotta horses, and sometimes of elephants, are dedicated to the deity known as *Dharma*. This *Dharma* cult, as the late MM. Haraprasad Shastri showed, is a survival of popular Buddhism within popular Hinduism (Brahmanism). The shapes of these West Bengal horses have some resemblance to those in the Dravidian country and they are sometimes quite as big as in the south. Islam in India replaced Buddhism and Brahmanism, and in the process took over a great deal from these cults; clay horses in shrines, whatever they mean, are a survival of primitive popular religion through Buddhism-Brahmanism and Islam.

The iron horse exhibited by Sir Lewis Fermor may be or may not be connected with the horse cult. It may be questioned whether it is really pre-historic. It does not look to be a horse rampant, but it is meant to stand on its four legs. Stylistically its shape reminds me of the horse in Northern European Art—for instance in Celtic copies of Greek coins, and in Early Germanic Art. Then, again, from its shape, one may ask whether it is a cult figure, or an ornamental one, or merely a horse's bit in the shape of a horse. Similarly figures forming decorative horse gear have been found elsewhere. At any rate, the figure is remarkable from many aspects—metallurgical, religious, mythological, and ethnological, and deserves careful scrutiny by specialists.

Sir Lewis Fermor, in reply to the discussion, thanked the members present for the interest they had taken in his little exhibit. With reference to the various points raised, he wished to emphasize that the specimen had been in Calcutta for 31 years without rusting, and that no special care had been taken to prevent this. Also it was necessary to emphasize that this horse was one of a group of horses that had been offerings to a local deity. There was no chance of the specimen being merely a horse's bit as suggested by Dr. Chatterji, unless all the clay horses at the same spot could be so regarded. As regards the stance of the horse, it seemed undoubtedly to be rampant as it stood very securely upon its hind legs and tail, and was very unstable on four legs, one of which actually does not touch the ground.

## 2. PERCY BROWN.—*Miniature Painting of a Mughal Prince.*

This portrait, which was acquired in Kashmir some years ago, has been identified as Prince Dara Shikoh, eldest son of the Emperor Shah Jahan (1627–58). There are authentic portraits of this prince to which this miniature bears a strong resemblance. The portrait is rather larger in scale than the usual Mughal miniature as the face itself measures over 3 inches in length.

The miniature is an excellent example of the style of painting which prevailed at the Mughal Court towards the middle of the 17th century, and is most probably a contemporary portrait taken from life. It is representative of the Mughal School when it had just passed its meridian under the Emperor Jahangir (1605–27), but in spite of this it is a significant work of art. It has every proof of being a good likeness, and its outlines are drawn with that dexterity that the best artists of the time invariably possessed. There is realism in every brush form, nothing is suggested, all is clear and distinctive, even to the slight degree of shading which was beginning to appear in the art at this time.

The subject of this portrait had a tragic career. We see him as a youth in a magnificent miniature of a scene preserved in the Bodleian Library at Oxford, where his father sits in Durbar surrounded by the members of his Court, Dara Shikoh and his younger brother Shuja attended by their tutor standing in respectful attitudes before the throne. Again he bestrides a prancing horse in true cavalier style in a picture in the Indian Museum, Calcutta. Later, however, Dara became the object of his younger brother Aurangzebe's intrigues which finally ended in his death, by which undoubtedly the Mughal dynasty lost a very promising member. Dara Shikoh possessed that interest in the arts which is the hall-mark of his family, and in the India Office Library there is a very precious album of pictures collected by this prince and bearing his name. History, and in any case the art history of Hindustan, might have taken a very different course had destiny allowed Dara Shikoh to succeed his father Shah Jahan.

One point about this miniature has a special interest. Towards the upper margin, in somewhat faint lettering, there is inscribed in Hindi characters what is presumed to be the name of the artist, Hunhar. There are several examples of miniature painting attributed to this artist among the collections of this school, and he appears to have been one of the leading painters at the Court of Shah Jahan. Except for these products of his brush little else is known of this Mughal painter.

Mr. Percy Brown remarked :—

This miniature, although found in Kashmir, was clearly not a production of the artists of that State, but an example of the Mughal *kalm*, as this art was practised by the painters at the court of Delhi towards the middle of the 17th century. It is no doubt a contemporary portrait of the Prince, of whose features a small 'thumb-nail' sketch would be made from life, and the picture worked up with great care and elaboration from this original impression. It is an exquisite example of the marvellous dexterity of brush-form and line-work attained by the exponents of this school, the outline of the profile being drawn with a sure and sensitive touch, while the eyes and ears are admirably rendered. Yet with all these qualities it did not represent the art quite at its best period, there is a stiffness and a slightly stylized appearance in the miniature as a whole, indicating the first symptoms of the decline.

The subject of this portrait lived his last few years in an atmosphere of tragedy, when, relentlessly pursued by his brother Aurangzebe, he was forced to take refuge in the trackless wastes of Sind, where several of his family died of heat and thirst. Eventually he was taken prisoner and executed. There are no indications of these troubles on the face in the portrait which bears a calm and serene expression, so that the sketch was obviously taken before these events began to cloud his short life.

With reference to the album of some 40 pictures inscribed with this Prince's name, and now preserved in the India Office Library in London, these show that Dara Shikoh had an intelligent taste in art but that he was also catholic in his views, as this *muraqqa* contains besides Indian miniatures several European engravings including one depicting 'St. Catherine of Siena' bearing its own date of A.D. 1585. Something of the mantle of his great grandfather, the Emperor Akbar, seems to have

fallen on this young man and inspired him to form such a collection of pictorial art.

Mr. O. C. Gangoly enquired of Mr. Brown if he had sufficient data to establish the identity of the portrait. So far as the speaker knew there are three portraits said to represent Dara Shikoh—one in the Louvre museum, another in a German collection, and the third in the Boston museum. It would be useful to compare these portraits in order to consider the authenticity of Mr. Brown's exhibit.

Mr. Van Manen said that a happy coincidence enabled him to reply to Mr. Gangoly's question. Dr. Hermann Goetz, at present resident in the Hague, had recently published an extremely detailed and valuable article on one of the sources for Nicolaas Witsen's work on North and East Tartary. Dr. Goetz had been so kind as to present to the Society's library a reprint of this article, which had originally appeared in the Dutch *Tijdschrift voor Geschiedenis*, Volume 50, No. 3, page 241. From this article it appears that the State collection of prints in Amsterdam possesses an album containing 49 miniatures of Indian Emperors, Princes and Dignitaries. This album is traced back to the possession of Nicolaas Witsen, the famous burgomaster of Amsterdam, who after his voyage to Moscow in 1664 commenced collecting materials for his big book on Tartary. The writer adds that it is even possible that this album may have originally belonged to Rembrandt. He comes to the conclusion that the album originated between March and September, 1686. He further shows that as far as is known at present, Holland was the first country to begin collecting specimens of Indian art on a large scale. Dr. Goetz further established the fact that fully 250 years ago extensive collections of Indian miniatures had been imported into Holland direct from India. Now, during 1724–1726 François Valentyn (1666–1727) published his enormous work on *The New and Old East Indies*. In the second part of the 4th volume he deals with the lives of the Great Moghuls, profusely illustrated with steel engravings, evidently based on Indian originals. On page 255 there is found a portrait of Dara Shikoh (spelled by him as 'Dara Sjecoer'). The speaker would pass round the illustration for comparison with Mr. Brown's exhibit and it would be found that both portraits were undoubtedly identical. Valentyn began the writing of his work shortly after 1714, less than 60 years after Dara Shikoh's death. The various dates just now enumerated furnish a strong argument for the probability that the existence of a portrait, published in Holland in the year 1726 and described as that of Dara Shikoh, enables us to establish the authenticity of an identical portrait purchased a few years ago in Kashmir. Is it possible to suggest that the Kashmiri portrait (which has been identified as a portrait of Dara Shikoh) may have been derived from the old Dutch publication?

Mr. Mukul Dey observed that the inscription on the portrait giving the name of its painter was undoubtedly in a very recent hand so that it was therefore improbable that the portrait could be even remotely contemporaneous with its subject.

Mr. Van Manen replied that it is a well-known fact that Indian sellers of antiquities often write identifications, attributions or dates on pictures and manuscripts. Lateness of such an inscription is no proof whatsoever of the age of the object itself.

### 3. M. MAHFUZ-UL HAQ.—*A note on a rare MS. of al-Aghrād-al-Tibbiya (an encyclopædia of medical science).*

On account of the lateness of the hour this exhibit was postponed to the next meeting.

## OBITUARY NOTICES.

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REV. FR. H. HOSTEN, S.J.

(1873-1935.)

The relations between the two great academical institutions of Park Street, St. Xavier's College and the Royal Asiatic Society of Bengal, have been varied and intimate. For the last seventy years at least the Society has always had one or other of the Jesuit Fathers amongst its Associate Members. From 1897 to 1899, Archbishop P. Goethals, S.J., was a Vice-President of the Society. The contributions of the learned Fathers to the Society's publications have been many and important. Amongst the most prolific of such writers was the late Fr. Henri Hosten, S.J., who died in Brussels on the 16th of April, 1935, in the 63rd year of his life. Father Hosten had been an Associate Member of the R.A.S.B. for a quarter of a century, having been elected as such in December, 1910. An indefatigable worker, he contributed 36 papers to the Society's *Journal* and 2 to its *Memoirs*, besides leaving behind the MSS. of a number of papers for subsequent publication.

Father Hosten was decidedly a 'character', described by one of his colleagues as to the end of his life 'un grand enfant'. His devotion to antiquarian research knew no bounds; perhaps sometimes went beyond them. He was of a simple, friendly, guileless character, yet not without explosive matter in his make up. In polemics his whole-hearted zeal sometimes made him hit harder than he perhaps intended or really wished and never with lasting rancour. One of his own colleagues once said when about to deliver a lecture: 'Keep Father Hosten at home. I do not want him to pick holes in my lecture'. He had what the Belgians call 'een strijdbare ader', a combative vein, within him. Nevertheless, this side had practically only the effect of accentuating his winning qualities. As a result he was a much-beloved man wherever he went, be it as priest or scholar. Innumerable anecdotes are being told about him; how a high-placed lady once visited the College and was received by him as what she described 'un Jésuite en négligé'; or how he was so enthusiastic in teaching Latin that his pupils would actually come to blows over a point of Latin syntax; and in the archives of our own Society there are records of some whirlwinds raised by him in connection with his publications.

None of these things, however, could diminish the respect and affection which he inspired.

He was born at Ramscapelle in Belgium, on March 26th, 1873. He entered the Society of Jesus in September, 1891. In his youth he was suspected of being a consumptive and in 1893 came out to the East, to Kandy in Ceylon, with an expectation of only three more months of life. He took part there in the foundation of the Papal Seminary and began teaching with a dozen pupils. Instead of dying, he flourished. In 1906 he was ordained a priest in Kurseong.

In the meantime, before coming North, Father Hosten had already begun to study the dolmens, cromlechs and pottery of South India when being stationed at Shembaganur, near Kodaikanal. It was then also that he began his autodidactic studies of Portuguese. Soon after he was transferred to the Calcutta Archdiocese where he laboured for 29 years. When stationed in Kurseong he founded there together with the Fathers A. Wouters and P. Feron an Indian Academy.

Soon Father Hosten made himself thoroughly familiar with the Spanish, Portuguese and Italian of early missionary reports. The Latin and French were already there from the beginning. These documents became his passion; their study and publication his life-work. His powers of application were of a very high order and his typewriter was a singularly hard-worked instrument. His manuscripts, single-spaced, with the accents and corrections in the finest, microscopic, spidery writing, were marvels.

Father Hosten published anywhere and everywhere, wherever an opportunity was found; in newspapers, popular magazines, academic journals and as separate publications.

His most substantial publication perhaps was that of the memoirs of Monserrate concerning his mission to the court of Akbar, published in this Society's *Memoirs*. But his total output was exceptionally varied and numerous. The Goethals Library Catalogue contains 72 entries of works by his hand. We are informed that the Library of the Indian Academy at Kurseong contains 40 manuscript volumes prepared by him and containing partly unpublished MS. material, whilst some similar material is preserved in the St. Xavier's Library in Calcutta.

Father Hosten has from the very beginning been not only a digger-up, collector and editor of his documents, but always a most generous helper to others. He co-operated largely in the production of the History of the Bengal Mission by H. Jossion, S.J., and in a recent volume on *The Jesuits and the great Moghul*, its author, Sir Edward Maclagan, pays a glowing tribute to Father Hosten on whose various publications the work in so far as regards information not already available in 1896, is largely based.

Father Hosten retired from Bengal to Europe in 1931 on account of ill-health. In his native Flanders, whenever his

doctors did not forbid it, he continued searching for documents and keeping up a busy correspondence with scholars.

His death came suddenly and unexpectedly.

The writer of this notice, who had many occasions to come in close contact with this loveable and dignified priest and scholar, can only voice the universal sense of loss caused by his death. In this Society his name will be long held in honour. R.I.P.

JOHAN VAN MANEN.

SYLVAIN LÉVI.

(1863-1935.)

Sylvain Lévi belonged to the giants. The *Encyclopædia Britannica* described him in 1929 as follows:—

‘French orientalist born in Paris on March 28th, 1863. Educated at the University of Paris. In 1886 he was appointed a lecturer at the school of higher studies in Paris. As special lecturer in Sanskrit he taught at the faculty of letters from 1889 to 1894 when he was appointed to a professorship at the College de France. In 1897 and 1898 he made tours of scientific research in India and Japan, and from 1921 to 1923 he travelled in India, Indo-China, Japan, Korea, Siberia and Russia. Prof. Lévi became a director at the school of higher studies and a member of numerous societies, including the Royal Asiatic Society, the Linguistic Society and the Society of Jewish Studies.’

The remaining years may be as briefly summarized as follows:—

In 1926 he left for Japan, for a third time, and there laid the foundation of a Research Institute called the *Maison Franco-Japonaise*. In 1928 he returned and visited India again, also for the third time, as well as Java and Bali. In the same year he founded the *Institut de Civilisation Indienne* in Paris, in connection with the University.

In October 1928 he was back in Paris where the remaining years of his life were spent in great literary productiveness. On the 30th of October 1935 a sudden death, without suffering or previous illness, put an end to his laborious life.

It cannot be our intention in this note to recount in detail, still less to discuss or appreciate, Lévi's scholarship. Eloquent and ample descriptions of his life-work have been given in many places. The *Journal Asiatique* for January-March, 1936, contains a detailed monograph by L. Renou on his scholarly record.

The *Bulletin de la Maison Franco-Japonaise* of Tokyo, for 1936, completes the data in four separate articles. His pupil P. C. Bagchi has published a bibliography of 139 titles of works from his hand in the 12th volume of *The Indian Historical Quarterly*. Elsewhere, in many places, due honour has been paid to his memory. It has been said that, however great a linguist he was, a Master of Sanskrit, Chinese and many old and modern Indian dialects, he was primarily an historian. But that is thinking of him as the scholar. Here we will speak chiefly of the human side of this Honorary Fellow (since 1920) of the Royal Asiatic Society of Bengal. In him the great scholarship never dimmed the great humanity. He was a great bookman but in no sense a bookish man. He was learned but never arid. He was a great classicist but intensely aware of the actual current of life. Of nervous activity, he was a great organizer. He held the secret of converting his many pupils into admirers and friends and of communicating some of his own zeal to them. A typical anecdote is told by Bagchi: 'His house was always open to receive Indian students, and those who have come in contact with him cannot forget the great qualities of his heart. Amongst manifold preoccupations he has often been seen, at the age of 60, running from hotel to hotel to find convenient rooms for a newly arrived Indian student.' During his stay at Shantiniketan he easily dropped into Indian ways of living, thinking and feeling, and merged into the spiritual atmosphere. The great success of his two visits to Nepal was no doubt due to this adaptability and inner affinity with the East. So it was in Japan, so elsewhere. We remember a day when in the Buddhist Vihara in Calcutta a special meeting was held in his honour. The writer of this note was one of the speakers and remarked that if there were something in the power of names it was not strange that Sylvain Lévi was at home in India. Was Lévi not the same as Brāhmaṇa, and Sylvain as Āraṇyaka? This allusion seemed to touch the distinguished guest deeply. He jumped from the platform and warmly kissed the speaker on both cheeks, a typical manifestation of his affectionate nature.

Sylvain Lévi has been a powerful ambassador and interpreter of the West to the East, and of the East to the West. He was a unifier in a discordant world. He never lost the simplicities in his learning, nor was ever his warm heart chilled by the strong cold light of his powerful reason.

It is always something great when real intellect does not obscure goodness, and when vast erudition does not dry up the waters of life.

In Sylvain Lévi the scholar and the man were both exceptional and of outstanding merit. Those who had the privilege of knowing him, will reckon it as something precious to have met him on the path of existence, to have basked in the radiations of his mind and heart. They cannot but realize that the memories

of meeting or companionship with him will remain true joys, privileges to be cherished throughout life.

JOHAN VAN MANEN.

*(Partly read in the Ordinary Monthly Meeting on the 4th November, 1935.)*

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HENRY FAIRFIELD OSBORN.

(1857-1935.)

The sad death of Henry Fairfield Osborn, Zoologist, Palæontologist, Educationist, Author and Administrator, at the age of 78 has created a gap among the American men of Science which it would be hard to fill. President Osborn—as he was generally known in America since he became the President of the Board of Trustees of the American Museum of Natural History, New York, in 1908 after the death of President Jesup—made very valuable contributions to the sciences of Zoology, Palæontology and Biology : a great deal of his Zoological and Palæontological work was essentially biological, in that it was carried out with a view to arriving at a better understanding of the nature, continuance and evolution of Life. In addition, his services in the cause of Education and his work as an administrator and author are so remarkable that any of these activities would have won him an outstanding place amongst the leading workers of the times.

Osborn was born on the 8th of August, 1857. He was educated in the Columbia Grammar School and Lyons Collegiate Institute of the New York City, and later graduated at Princeton. Taking up practical field work in the Museum of Geology and Archæology at Princeton after his graduation, he became the leader of the palæontological expeditions of the University to Colorado and Wyoming in 1877 and 1878. In 1878-79 he took courses in Anatomy and Histology at the College of Physicians and Surgeons in New York, and in 1879-80 went to Europe, where he studied embryology at Cambridge under Professor Francis Balfour and Comparative Anatomy in London under Professor Thomas Henry Huxley. In 1881 he was appointed as the Assistant Professor of Natural Science at Princeton, and in 1883 as the Professor of Comparative Anatomy ; this latter post he held till 1890. In 1891 he was appointed to the Da Costa chair of Biology of the Columbia University, and from 1892-95 he also served as the Dean of the Faculty of Pure Science of the University. In 1910 he retired from active teaching at Columbia,



but up to his death retained his connection with the University as the Research Professor of Zoology.

In 1900 Osborn was appointed as the Vertebrate Palæontologist of the U.S. Geological Survey, and in 1924 he was promoted to the rank of its Senior Geologist. In 1906 he was unanimously elected as the Secretary of the Smithsonian Institution, the highest scientific post in the United States of America, but in view of his great interest in the American Museum of Natural History he declined this high honour.

In addition to being a trustee and curator of several divisions of the American Museum of Natural History, New York, he served as its Vice-President (1899-1901) and was its President from 1908 to the date of his death. During his Presidential administration he inaugurated a very efficient plan for the internal organization of the American Museum; the most important development for the instruction and recreation of the visiting non-scientific public has been the preparation and installation of attractive museum groups in replicas of their natural surroundings in almost all sections of the Museum. He was also responsible for sending numerous expeditions to collect natural history material not only in different parts of America but almost all over the world. It was his far-seeing policy that has made the American Museum of Natural History one of the biggest institutions of its kind, with its very rich study collections for research, and the beautiful and instructive exhibits in its very extensive public show galleries. His work in the cause of public education was considered of so great an importance as to be acknowledged by the award of the Roosevelt Medal of Honour, presented by President Harding in 1923.

His first scientific contribution was published at the age of 21, and since that date during the 58 years of his active life he published an enormous number of original contributions either in the form of papers and monographs or as separate volumes dealing with special subjects.

The new biological principles which he enunciated as a result of an inductive line of investigations on fossil vertebrates have not all been universally accepted, but the environmental principles of adaptive radiation, polyphyletic evolution and homogenic classification have gained wide support amongst Palæontologists and, to some extent, among Zoologists.

President Osborn was a member of a large number of scientific academies and societies, and was also the recipient of a large number of medals and awards both in the United States and of the leading scientific societies all over the world. He was a foreign member of the Royal Society of London and was the only Zoologist to be elected as a Centenary Anniversary Fellow of the Asiatic Society of Bengal in 1934. The writer had the privilege of meeting him first in 1925 on the occasion of the Meeting of the British Association for the Advancement of Science in

Oxford and later in New York in 1930, and can never forget the impression created by his masterful personality. He was a charming man, pleasant and unassuming to talk to, and his interest in anything relating to Science and Education was all-absorbing. May his soul rest in peace !

B. PRASHAD.

*(Read in the Ordinary Monthly Meeting on 2nd December, 1935.)*



## PROCEEDINGS OF THE MEDICAL SECTION MEETINGS, 1935.



NOVEMBER, 1935.

A meeting of the Medical Section of the Asiatic Society of Bengal was held on Monday, the 18th November, 1935, at 6 P.M.

PRESENT.

LT.-COL. R. KNOWLES, C.I.E., B.A., M.R.C.S., L.R.C.P.,  
I.M.S., F.A.S.B., Vice-President, in the Chair.

*Members :*

Hora, Dr. S. L.  
Mallya, Major B. G.

Pasricha, Capt. C. L.  
White, Dr. R. Senior

(There were five visitors present.)

The minutes of the last meeting were read and confirmed.

The following papers were read :—

1. S. L. HORA.—*Recent Indian cases of live fishes impacted in the food and air passages of man.*

In a series of three articles, Dr. E. W. Gudger has brought together 38 recorded cases of live fishes in the human food and air passages. These records date from 1567 to 1933 and show that the phenomenon occurred in several countries. Of the 38 cases discussed by Gudger, 12 are known to have occurred in India and Burma. Through the kind help of Major-General D. P. Goil, 19 more cases have been collected from all over India and Burma—1 from the Bombay Presidency, 6 from the Madras Presidency, 3 from Bihar and Orissa, 1 from Bengal, 5 from Assam, and 3 from Burma. Of the 31 cases, 17 were due to *Koi* (*Anabas testudineus*), 4 to *Kholisha* (*Colisa fasciata*), and 1 each to *Mastacembelus*, *Nandus*, and *Cynoglossus*. The types of fish responsible for the remaining 7 accidents are not known. As regards the location of the impacted fishes, in all Indian cases discussed by Gudger the fish were found in the pharynx. Of the 19 cases now recorded, in 13 cases the fish was lodged in the food passage and in 6 cases in the air passage. The reports regarding the nature of treatment and the condition of patient are given, while the surgical aspect of these cases will be discussed by Lt.-Col. B. G. Mallya. The various types of fish enumerated above will be exhibited.

In explaining his paper Dr. Hora remarked that the accounts of two accidents of impaction of live fishes in the throat of man that appeared in the *Statesman* during 1927 and 1934 attracted his attention and with a view to ascertain the frequency of such occurrences and to know the types of fishes responsible for such accidents he had a circular sent to all government medical officers through the courtesy of Major-General D. P. Goil. The reports received are of considerable interest as they show that the accidents are restricted mainly to Madras, Orissa, Bengal, Assam, and Burma where *Koi* (*Anabas*) is found in considerable quantities and where people habitually use fish for food. No case has been reported from the North-West Frontier Province, the Punjab, the Central Provinces, and the United Provinces, and there is only one case reported from Bombay in which the fish concerned was a *Mastacembelus*. The accounts of certain cases were read out and attention was directed to the form of body and the direction of spines in the various types of fishes found in the human food and air passages.

2. B. G. MALLYA.—*Surgical aspect of live fishes impacted in the human food and air passages.*

The treatment in cases of this type is that of a foreign body lodged in the food and air passages. These cases are surgical emergencies and hardly any time is available to prepare for an operation on an elaborate scale, let alone sending for a surgeon or a specialist in Ear, Nose, and Throat work.

The point that requires immediate attention is whether there is respiratory embarrassment or not. In the majority of such cases there is extreme urgency as revealed by the heavy mortality in the cases collected with such care and labour by Dr. S. L. Hora. While confronted with a case of extreme urgency of this type, it is the opinion of the author that the immediate treatment should consist in doing a tracheotomy as a life saving measure.

In further explaining his remarks Lt.-Col. Mallya stated that the treatment in cases of this type is that of a foreign body lodged in the food and air passages. Such cases are brought for treatment to the nearest dispensary by day or night and may be rightly classed as surgical emergencies. Foreign bodies in the pharynx and air passages cause suffocation and require immediate treatment. The first thing to do is to inspect the throat with a good light and explore with the finger. If the head of the fish is seen or felt it may be caught with a pair of forceps and pulled out. Such cases are however rare.

One such case came under my observation at the Chittagong General Hospital where a girl aged about nine years was brought with a fish stuck in her naso-pharynx. This fish had got in through the nose and inspection of the throat revealed its head which was caught with a pair of long forceps and the fish was pulled out. There was slight bleeding. This girl made an uneventful recovery as an out-door case. There was no respiratory embarrassment in this case.

In the majority of cases there is extreme urgency as revealed by the heavy mortality in the cases collected with such care and labour by Dr. S. L. Hora. The person is suffocated by the foreign body and signs of asphyxia are present. As death occurs in a few moments, there is hardly any time to prepare for an operation on an elaborate scale, let alone sending for a surgeon or a specialist in Ear, Nose, and Throat work.

In cases of extreme urgency of this type immediate treatment consists in doing a tracheotomy as a life saving measure and if no instruments are

available a pocket knife may be used for giving the patient air which he needs most at this moment. Tracheotomy is an urgent operation and every medical man is expected to do this operation with any instruments at hand at any time.

Dr. *Nag Choudhury* stated that at the request of Lt.-Col. Mallya, he had studied all the cases reported by Dr. Gudger and those recently collected by Dr. Hora. He observed that the tenacity of life of the fishes concerned in these accidents, especially that of *Koi*, makes the task of handling the fish very difficult, for, as long as the fish is alive, it can raise its spines and can make forward progress in the food or air passage. In the treatment of such cases, there are four main considerations: (i) condition of the patient, (ii) part of the passage obstructed—pharynx, oesophagus, larynx, trachea, lung, etc., (iii) the type of fish impacted, and (iv) appliances to be used. For the purposes of treatment such cases can be divided into six main groups according to the part of the passage obstructed: (i) Oropharynx, (ii) Hypo-pharynx, (iii) Oesophagus; upper, middle, and lower parts, (iv) Larynx, (v) Trachea, and (vi) Lungs or Bronchi.

According to the condition of the patient a stimulant must be given to prevent shock and reflex spasms of pharyngeal and laryngeal muscles. In the cases of respiratory embarrassment tracheotomy or laryngotomy should be performed at once. After these life saving measures have been taken the actual state of affairs should be ascertained by passing the oesophagoscope and laryngoscope. If the head of the fish can be located within easy reach it should be held by a long pair of forceps and the fish pulled out. If the fish is deeply impacted then with the help of an endoscope the gill covers and fin spines should be cut with long cutting forceps. The fish should then be pulled out and the cut portions should be removed afterwards separately. In some cases it may be necessary to expose the pharynx by lateral pharyngotomy to pull out the fish with the head first through the wound. When the fish happens to be in the middle or lower parts of the oesophagus, then it should be pushed down into the stomach where it may be allowed to remain for normal digestion or taken out by gastrotomy, as may appear most suitable. In the case of the larynx, trachea, and bronchi a low tracheotomy is essential and all effort should be made to restore respiration as early as possible. The fish should be then pulled out through the wound with the help of the bronchoscopy tube bit by bit, may be in two or three sittings.

In summing up the author referred to the bad custom of biting off the heads of these fishes which sometimes leads to calamitous results and deprecated the use of the probang in such cases. He advocated the use of X-rays, where available, for the precise location of the fish before operation.

Lt.-Col. *R. Knowles* thanked the three authors on behalf of the Society for the interesting and valuable papers they had communicated to its Medical Section. He referred to an old case of thirty-three years ago where a cat was concerned. A long fish bone had stuck in the throat of the cat and it was possible to remove it with the help of a probang. He enquired from Dr. Hora the percentage of mortality in the cases recently collected by him.

Capt. *C. L. Pasricha* enquired whether it was not possible to remove an impacted fish from the throat bit by bit by cutting off portions of it. In the case of air-breathing fishes, such as *Koi*, he suggested that an injection should be given to kill them at once.

In reply to Col. Knowles Dr. *Hora* stated that there were twelve deaths out of the nineteen cases collected by him recently.

In reply to Capt. Pasricha Dr. *Hora* stated that Dr. Francis Day, a Medical Officer and the greatest student of Indian Fishes, suggested the removal of the fish bit by bit after attending to the respiratory embarrassment first. In his opinion the portions of the fish which could not be

easily removed should be allowed to stay *in situ* till they decay and fall down. The smell is immaterial in such cases where it is a question of life and death.

Capt. *Pasricha* suggested that with the modern appliances it should be possible to suck out the inner mass of the fish after removal of such of its portion which could be easily handled.



#### DECEMBER, 1935.

A meeting of the Medical Section of the Asiatic Society of Bengal was held on Tuesday, the 17th December, 1935, at 6 P.M.

#### PRESENT.

SIR LEWIS FERMOR, Kt., O.B.E., A.R.S.M., D.Sc. (London), F.G.S., M.INST.M.M., F.R.S., F.A.S.B., President, in the Chair.

#### Members :

Basu, Mr. N. M.	Chopra, Lt.-Col. R. N.
Brahmachari, Sir U. N.	Lal, Dr. R. B.
	Mukherjee, Dr. J. N.

(There were twelve visitors present.)

The minutes of the last meeting were read and confirmed.

The following paper was read :—

LT.-COL. R. N. CHOPRA and A. C. ROY.—*Some Biochemical Characteristics of Snake Venoms.*

Some biochemical characteristics of snake venoms were investigated. Cobra and Russel's viper venoms were selected for this study because though they have some pharmacological properties in common, they differ strikingly in other respects. Thus, the neurotoxic element is preponderant in the cobra venom, while hæmorrhagic or anticoagulant property is more or less peculiar to the venom of the viper, the nervous centres being not much affected. The results of experiments carried out by these workers suggest that by the process of filtration through Seitz filter either the hæmolytic element has been altogether eliminated or it has been inactivated in such a manner that it is incapable of being reactivated by lecithin. The former hypothesis appears to be the more probable one, as Houssay (1921) found that the hæmolytic substance of snake venom is absorbed by animal charcoal, the residual venom solution being non-hæmolytic. They believe that with Seitz filter also a similar process of adsorption is responsible for the loss of hæmolytic property.

Experiments are in progress with a view to ascertain the nature of this hæmolytic principle and also how far this process of filtration affects the other properties of the venom solutions.

Colonel *Chopra* gave the results of the pharmacological action of filtered and unfiltered venoms and pointed out that there was no doubt that the action on the blood pressure and respiration of the unfiltered venom was different from that of the filtered venom.

Dr. *R. B. Lal* suggested that attempts might be made to deadsorb the lytic principles retained in the Seitz filter and thus obtain it in a pure condition. For this purpose filtering materials such as kaolin might be used, and care should be taken to prevent oxidation of the active principle.

Dr. *M. N. Bose* remarked that it is a well-known fact that cobra venom contains a lecithinase, and that the constitution of lecithin and kaephalin has been partly worked out with the help of the cobra venom.

Dr. *J. S. Chowhan* thought that filtering the venom through Seitz filter has the advantage of making it sterile, without the help of chemicals and at the same time of removing some of the toxic principles. He cited sixteen cases where cobra venom was used for cancer and different types of neuralgia.





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